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THE ROXBURGH FLORA INDICA DRAWINGS AT KEW*

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Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Hyperanthera 1217				
moringa	**2,**368 ;	360 ;	**58.**	
Hypericum 2110				
cernuum ...	**3,**400 ;	592 ;	**1280.**	
monogynum ...	**3,**400 ;	592 ;	**977.**	
Impatiens 834				
Balsamina ...	**1,**651 ;	219 ;	— ;	no drawing.
natans	**1,**652 ;	219 ;	**440.**	
tripetala ...	**1,**651 ;	219 ;	**2454 ;**	No. 2455 on drawing.
Incarvillia 1739				
oblongifolia ...	**3,**113 ;	496 ;	— ;	no drawing.
parasitica ...	**3,**112 ;	495 ;	**2307 ;**	Pl. Corom. 291.
Indigofera 2077				
arborea	**3,**381 ;	586 ;	**1626 ;**	Wight Ic. 368.
argentea ...	**3,**374 ;	583 ;	**383 ;**	Wight Ic. 331.
aspalathifolia ...	**3,**371 ;	582 ;	**3781.**	
atropurpurea ...	**3,**381 ;	586 ;	**1627 ;**	Wight Ic. 369.
cinerea	**3,**372 ;	583 ;	**380 ;**	Wight Ic. 386.
caerulea	**3,**377 ;	584 ;	**388 ;**	Wight Ic. 366 ; there are two drawings, one is part of the set sent home to the East India Company by Roxburgh, and bears his number and name ; the other belongs to the set which is usually unnumbered, but this particular drawing has the number 388 on it, the dissections are the same as those of the E.I.C. copy, but otherwise the drawing is different.
echinata ...	**3,**370 ;	582 ;	**377 ;**	Wight Ic. 316.
elliptica ...	**3,**380 ;	585 ;	**1991.**	

*Continued from Kew Bull. **1956,** 348.

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Indigofera—*continued*				
enneaphylla	3,376 ;	584 ;	**390 ;**	Wight Ic. 403.
flaccida	3,375 ;	584 ;	**384 ;**	Wight Ic. 387.
fragrans ...	3,375 ;	584 ;	**386 ;**	Wight Ic. 385.
glandulosa ...	3,373 ;	583 ;	**381.**	
hirsuta	3,376 ;	584 ;	**385.**	
linifolia	3,370 ;	582 ;	**376 ;**	Pl. Corom. 195 ; Wight Ic. 313.
prostrata ...	3,373 ;	583 ;	**382.**	
pulchella ...	3,382 ;	586 ;	**389 ;**	Wight Ic. 367.
purpurascens ...	3,383 ;	586 ;	**1899.**	
tinctoria ...	3,379 ;	585 ;	**391 ;**	Wight Ic. 365.
trita	3,371 ;	583 ;	**379 ;**	Wight Ic. 315.
uncinata ...	3,382 ;	586 ;	**2331.**	
uniflora	3,374 ;	583 ;	**1625 ;**	Wight Ic. 333.
violacea ...	3,380 ;	585 ;	**2330.**	
virgata	3,383 ;	586 ;	**2544 ;**	No. 2538 on drawing.
viscosa	3,377 ;	584 ;	**387 ;**	Wight Ic. 404.
Inocarpus 1277				
edulis	2,416 ;	376 ;	**1844 ;**	Pl. Corom. 263.
Ipomaea 591				
caerulea	1,501 ;	168 ;	**571.**	
caerulescens ...	1,500 ;	168 ;	**1951.**	
grandiflora ...	1,497 ;	167 ;	**567.**	
multiflora ...	1,499 ;	168 ;	**572.**	
muricata ...	1,499 ;	167 ;	**569.**	
Pes-tigridis ...	1,503 ;	169 ;	**1795.**	
phoenicea ...	1,502 ;	169 ;	**1216.**	
pileata	1,504 ;	169 ;	**2435.**	
Quamoclit ...	1,503 ;	169 ;	— ;	no drawing.
salicifolia ...	1,498 ;	167 ;	**2039.**	
sepiaria	1,499 ;	168 ;	**570.**	
tuberosa ...	— ;	— ;	**1028 ;**	description under this name in the Kew MS., drawing named *Convolvulus formosus*.
Iris 184				
chinensis ...	1,170 ;	57 ;	— ;	no drawing.
Ischaemum 358				
aristatum ...	1,319 ;	107 ;	**1779.**	
conjugatum ...	1,321 ;	108 ;	**1940.**	
cuspidatum ...	1,324 ;	108 ;	**1781.**	
geniculatum ...	1,322 ;	108 ;	**1941.**	
monostachyon ...	— ;	— ;	**2109 ;**	in Kew MS. but apparently omitted from Flora Indica.
repens	1,323 ;	108 ;	**2108.**	
rugosum ...	1,320 ;	107 ;	**899.**	
semi-sagittatum ...	1,320 ;	108 ;	**1780.**	
tenellum ...	1,323 ;	108 ;	**900.**	
Isoetes				
capsularis ...	— ;	745 ;	**696.**	
coromandeliana ...	— ;	746 ;	**697.**	
Itea 726				
macrophylla ...	— ;	— ;	**2441 ;**	Roxburgh's description and figure are under " Moalmurreah " but this was not included in Flora Indica (1832) ; the plant was named *Itea macrophylla* Wall. in Fl. Ind. 2,419 (1824).
umbellata ...	1,632 ;	212 ;	— ;	no drawing.

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Ixora 419				
acuminata ...	1,383 ;	128 ;	**2428.**	
alba	1,379 ;	127 ;	**911 ;**	Wight Ic. 707 ; also an unnumbered drawing which is almost exactly the same as No. 911.
Bandhuca ...	1,376 ;	126 ;	**1783 ;**	Wight Ic. 149.
barbata	1,384 ;	129 ;	**912 ;**	Wight Ic. 185.
brachiata ...	1,381 ;	128 ;	**1942 ;**	Wight Ic. 710.
coccinea ...	1,375 ;	126 ;	**166 ;**	Wight Ic. 153.
congesta ...	1,387 ;	130 ;	— ;	no drawing.
cuneifolia ...	1,380 ;	127 ;	**1785 ;**	Wight Ic. 709.
fulgens	1,378 ;	127 ;	**1784 ;**	Wight Ic. 151.
lanceolaria ...	1,387 ;	130 ;	— ;	no drawing.
parviflora ...	1,383 ;	128 ;	**167 ;**	Wight Ic. 711.
Pavetta	1,385 ;	129 ;	**168 ;**	Wight Ic. 148.
stricta	1,379 ;	127 ;	**1337** & **911/a ;**	Wight Ic. 184, 707 ; on the drawing of No. 911, *I. alba*, is a figure (a) of a pink-flowered inflorescence which seems to be the plant referred to as *I. stricta* in Flora Indica, **1**,379.
tenuiflora ...	1,387 ;	129 ;	— ;	no drawing.
tomentosa ...	1,386 ;	129 ;	**169 ;**	Wight Ic. 186.
undulata ...	1,385 ;	129 ;	**913 ;**	Wight Ic. 708.
villosa	1,383 ;	128 ;	**2179 ;**	Wight Ic. 150 ; the leaves in the drawing are uncoloured.
Jasminum 94				
angustifolium ...	1,96 ;	32 ;	**182 ;**	Wight Ic. 698.
arborescens ...	1,95 ;	32 ;	**1514 ;**	Wight Ic. 699.
auriculatum ...	1,98 ;	33 ;	**181 ;**	Wight Ic. 700.
bracteatum ...	1,94 ;	32 ;	**1767.**	
chrysanthemum ...	1,99 ;	33 ;	**2009.**	
coarctatum ...	1,92 ;	31 ;	— ;	no drawing.
elongatum ...	1,90 ;	30 ;	**1513 ;**	Wight Ic. 701.
grandiflorum ...	1,100 ;	35 ;	— ;	no drawing.
heterophyllum ...	1,100 ;	34 ;	— ;	no drawing.
lanceolaria ...	1,98 ;	33 ;	**2414.**	
latifolium ...	1,95 ;	32 ;	**183 ;**	Wight Ic. 703.
laurifolium ...	1,92 ;	31 ;	**2412.**	
paniculatum ...	1,99 ;	33 ;	— ;	no drawing.
pubescens ...	1,91 ;	31 ;	**1015 ;**	Wight Ic. 702.
scandens ...	1,89 ;	30 ;	**1766.**	
simplicifolium ...	1,97 ;	33 ;	**1512 ;**	Wight Ic. 705 ; drawing named *J. diffusum.*
trinerve	1,93 ;	31 ;	**2413.**	
tubiflorum ...	1,97 ;	33 ;	— ;	no drawing.
Zambac	1,88 ;	30 ;	**180 ;**	Wight Ic. 704.
Jatropha 2435				
Curcas	3,686 ;	689 ;	**5.**	
glandulifera ...	3,688 ;	689 ;	**1688.**	
Johnia 183				
coromandeliana ...	1,169 ;	56 ;	**534.**	
salacioides ...	1,168 ;	56 ;	**1520.**	
Jonesia 1042				
Asoca	2,218 ;	312 ;	**935.**	
scandens ...	2,220 ;	313 ;	— ;	no drawing.
triandra	2,220 ;	313 ;	— ;	no drawing.
Juglans 2372				
pterococca ...	3,631 ;	670 ;	**2395.**	
regia	3,631 ;	670 ;	— ;	no drawing.

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Juniperus 2612				
aquatica ...	**3,**838 ;	741 ;	— ;	no drawing.
cernua	**3,**839 ;	741 ;	— ;	no drawing.
chinensis Willd. ...	**3,**838 ;	741 ;	— ;	no drawing.
chinensis Roxb. ...	**3,**840 ;	741 ;	— ;	no drawing.
communis ...	**3,**839 ;	741 ;	— ;	no drawing.
dimorpha ...	**3,**839 ;	741 ;	— ;	no drawing.
elata	**3,**838 ;	741 ;	— ;	no drawing.
Jussieua 1259				
exaltata ...	**2,**401 ;	371 ;	**645.**	
repens	**2,**401 ;	371 ;	**644.**	
Justicia 122				
acaulis	**1,**119 ;	40 ;	**510 ;**	Pl. Corom. 127.
Adhatoda ...	**1,**126 ;	43 ;	**1201 ;**	drawing named *Dianthera adhota.*
alba	**1,**116 ;	39 ;	**1105.**	
Betonica ...	**1,**128 ;	43 ;	**1769.**	
bicalyculata ...	**1,**126 ;	42 ;	**511.**	
bivalvis	**1,**124 ;	42 ;	— ;	no drawing.
chinensis ...	**1,**124 ;	42 ;	**2011.**	
decussata ...	**1,**127 ;	43 ;	**2416.**	
Ecbolium ...	**1,**114 ;	38 ;	**508.**	
echioides ...	**1,**118 ;	40 ;	**1768.**	
Gendarussa ...	**1,**128 ;	43 ;	**514.**	
glabra	**1,**131 ;	44 ;	**513.**	
lamifolia ...	**1,**134 ;	45 ;	**1202 ;**	drawing named *Dianthera barlerioides.*
lanceolaria ...	**1,**121 ;	41 ;	**2415.**	
latebrosa ...	**1,**125 ;	42 ;	**512.**	
montana ...	**1,**110 ;	37 ;	**98 ;**	Pl. Corom. 176 ; in Flora Indica as *Eranthemum montanum.*
Nasuta	**1,**120 ;	40 ;	**44.**	
orixensis ...	**1,**132 ;	44 ;	— ;	no drawing.
paniculata ...	**1,**117 ;	40 ;	**509.**	
pectinata ...	**1,**133 ;	45 ;	**517 ;**	Pl. Corom. 153.
picta	**1,**117 ;	39 ;	**908.**	
polysperma ...	**1,**119 ;	40 ;	**1016.**	
procumbens ...	**1,**132 ;	45 ;	**515.**	
pulchella ...	**1,**111 ;	37 ;	**99 ;**	Pl. Corom. 177 ; in Flora Indica as *Eranthemum pulchellum.*
quinqueangularis	**1,**133 ;	45 ;	— ;	no drawing.
ramosissima ...	**1,**129 ;	44 ;	**1930.**	
repens	**1,**132 ;	44 ;	**516 ;**	Pl. Corom. 152.
speciosa ...	**1,**122 ;	41 ;	**1313.**	
thyrsiflora ...	**1,**114 ;	39 ;	**1312.**	
tinctoria ...	**1,**123 ;	41 ;	**909.**	
tomentosa ...	**1,**131 ;	44 ;	**519 ;**	also a copy of the Roxburgh drawing at Calcutta, received from Sir George King, which is markedly different from No. 519.
tranquebariensis ...	**1,**130 ;	44 ;	**518.**	
verticillata ...	**1,**135 ;	45 ;	— ;	no drawing.
vitellina ...	**1,**115 ;	39 ;	**2166.**	
Kaempferia 25				
angustifolia ...	**1,**17 ;	6 ;	**1103.**	
Galanga ...	**1,**15 ;	5 ;	**1011.**	
ovalifolia ...	**1,**19 ;	7 ;	**2155 ;**	Pl. Corom. 278.
pandurata ...	**1,**18 ;	6 ;	**1765 ;**	No. 1759 on drawing.
rotunda ...	**1,**16 ;	6 ;	**1012.**	
Kleinhovea 1780				
hospita	**3,**141 ;	505 ;	**1435.**	

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Kydia 1841				
calycina	**3**,188 ;	521 ;	**673 ;**	drawing missing ; Pl. Corom. 215 ; there is an unnumbered drawing different from t. 215, but closely resembling it in some particulars.
fraterna ...	**3**,189 ;	521 ;	**674 ;**	drawing missing ; Pl. Corom. 216.
Kyllingia 195				
cyperoides ...	**1**,182 ;	61 ;	**769.**	
monocephala ...	**1**,180 ;	61 ;	**766.**	
triceps	**1**,181 ;	61 ;	**767.**	
umbellata ...	**1**,182 ;	61 ;	**768 ;**	also an unnumbered drawing different from No. 768.
Lactuca 2114				
sativa	**3**,403 ;	593 ;	— ;	no drawing.
Lagerstroemia 1373				
grandiflora ...	**2**,503 ;	404 ;	**1852.**	
indica	**2**,505 ;	404 ;	**30 ;**	also an unnumbered drawing which is a replica of No. 30.
parviflora ...	**2**,505 ;	404 ;	**32 ;**	Pl. Corom. 66 ; also an unnumbered drawing which is a replica of No. 32.
regina	**2**,505 ;	404 ;	**31 ;**	Pl. Corom. 65 ; also an unnumbered drawing which is almost a replica of No. 31.
Lantana 1709				
indica	**3**,89 ;	488 ;	**1464.**	
Lappago 312				
biflora	**1**,281 ;	94 ;	**780.**	
Lathyrus 2020				
Aphaca	**3**,322 ;	566 ;	— ;	no drawing.
sativus	**3**,322 ;	566 ;	**1161.**	
Laurus 1128				
bilocularis ...	**2**,311 ;	341 ;	**2052 ;**	Wight Ic. 1828.
camphorifera ...	**2**,304 ;	339 ;	**1415**	Roxburgh made two descriptions
	2,306 ;	340 ;	**2054**	of this species and had a drawing made for both.
Cassia	**2**,297 ;	337 ;	**1413 ;**	Wight Ic. 140 ; there is also an unnumbered drawing which is a replica of No. 1413.
Cinnamomum ...	**2**,295 ;	336 ;	**1058** & **2051.**	
Culitlaban ...	**2**,299 ;	338 ;	**2486 ;**	Wight Ic. 137 ; No. 2483 on drawing.
dulcis	**2**,303 ;	339 ;	**1059 ;**	Wight Ic. 138.
glaucescens ...	**2**,307 ;	340 ;	**2234.**	
involucrata ...	**3**,824 ;	736 ;	**66 ;**	Pl. Corom. 187 ; in Flora Indica as *Tetranthera pentandra.*
lanceolaria ...	**2**,309 ;	341 ;	**2233 ;**	Wight Ic. 1821.
malabathrica ...	**2**,297 ;	337 ;	— ;	no drawing.
multiflora ...	**2**,298 ;	338 ;	**1414 ;**	Wight Ic. 131.
nitida	**2**,300 ;	338 ;	**1966 ;**	Wight Ic. 124 ; also an unnumbered drawing almost a replica of No. 1966.
obtusifolia ...	**2**,302 ;	339 ;	**2232.**	
porrecta	**2**,308 ;	340 ;	**2053 ;**	Wight Ic. 1832 as *Sassafras parthenoxylon.*

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Laurus—*continued*				
recurvata ...	2,301 ;	338 ;	**1060 ;**	Wight Ic. 133 ; also an unnumbered drawing closely resembling No. 1060.
villosa	2,310 ;	341 ;	**2235 ;**	Wight Ic. 1822.
Lawsonia 1085				
inermis ...	2,258 ;	325 ;	**627.**	
Leea 1058				
crispa	1,654 ;	220 ;	**924.**	
hirta	1,656 ;	220 ;	**923.**	
integrifolia ...	1,659 ;	221 ;	**196.**	
macrophylla ...	1,653 ;	219 ;	**925.**	
robusta	1,655 ;	220 ;	**2043.**	
sambucina ...	1,657 ;	221 ;	**1373.**	
Staphylea ...	1,658 ;	221 ;	**195.**	
Leersia 1029				
aristata	2,207 ;	308 ;	**1051.**	
ciliata	2,208 ;	309 ;	**2476 ;**	No. 2474 on drawing.
Lemna 2289				
cruciata ...	3,566 ;	648 ;	— ;	no drawing.
globosa	3,565 ;	648 ;	— ;	no drawing.
orbiculata ...	3,565 ;	648 ;	— ;	no drawing.
Leonurus 1601				
tataricus ...	3,8 ;	461 ;	**1252 ;**	drawing is named *Leonurus indicus*.
Lepidagathis 1659				
cristata ...	3,53 ;	476 ;	**1872 ;**	Pl. Corom. 267.
Lepidium 1748				
sativum	3,116 ;	497 ;	— ;	no drawing.
Thlaspi	3,116 ;	497 ;	— ;	no drawing.
Lettsomia 580				
aggregata ...	1,488 ;	164 ;	**1792 ;**	drawing is named *Convolvulus aggregatus*.
argentea ...	1,489 ;	164 ;	**916.**	
Bona-nox ...	1,494 ;	166 ;	**2038 ;**	drawing named *Ipomoea Bona-nox*.
cuneata	1,491 ;	165 ;	**1213 ;**	drawing named *Convolvulus cuneatus*.
cymosa ...	1,492 ;	165 ;	**1948 ;**	drawing named *Convolvulus cymosus*.
nervosa	1,489 ;	164 ;	**556.**	
ornata	1,496 ;	167 ;	**1535 ;**	drawing named *Ipomoea ornata*.
pomacea ...	1,493 ;	166 ;	**1361 ;**	drawing named *Ipomoea pomacea*.
setosa	1,490 ;	165 ;	**1791 ;**	drawing named *Convolvulus setosus*.
splendens ...	1,487 ;	164 ;	**2434 ;**	drawing as No. 2572 *Convolvulus splendens*.
strigosa ...	1,491 ;	165 ;	**1215 ;**	drawing named *Convolvulus strigosus*.
uniflora	1,495 ;	166 ;	**568.**	
Leucocephala 2351				
graminifolia ...	3,612 ;	664 ;	**1176.**	
spathacea ...	3,613 ;	664 ;	**1177.**	
Licuala 1000				
peltata	2,179 ;	299 ;	**1829.**	
spinosa	2,181 ;	300 ;	— ;	no drawing.

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Ligusticum 911				
Ajowan	**2,**91 ;	271 ;	**1042 ;**	Wight Ic. 566.
diffusum ...	**2,**92 ;	271 ;	**1043 ;**	Wight Ic. 569.
Ligustrum				
nepalense ...	**1,**149 ;	50 ;	— ;	no drawing.
Limodorum 2185				
aphyllum ...	**3,**462 ;	613 ;	**241 ;**	Pl. Corom. 41 ; in Flora Indica as *Cymbidium aphyllum.*
bicolor	**3,**469 ;	615 ;	**2342.**	
bracteatum ...	**3,**466 ;	615 ;	— ;	no drawing.
candidum ...	**3,**470 ;	616 ;	**2343.**	
longifolium ...	**3,**468 ;	615 ;	**2345.**	
nutans	**3,**470 ;	616 ;	**240 ;**	Pl. Corom. 40.
plicatum ...	**3,**465 ;	614 ;	**1906 ;**	no drawing.
ramentaceum ...	**3,**467 ;	615 ;	**2344.**	
recurvum ...	**3,**469 ;	616 ;	**239 ;**	Pl. Corom. 39.
Tankervillia ...	**3,**466 ;	615 ;	— ;	no drawing.
virens	**3,**467 ;	615 ;	**238 ;**	Pl. Corom. 38.
Limonia 1230				
arborea	**2,**381 ;	364 ;	**146 ;**	Pl. Corom. 85.
bilocularis ...	**2,**377 ;	363 ;	**2242.**	
citrifolia	**2,**379 ;	363 ;	**2243.**	
crenulata ...	**2,**381 ;	364 ;	**76 ;**	Pl. Corom. 86.
monophylla ...	**2,**378 ;	363 ;	**143.**	
pentagyna ...	**2,**382 ;	364 ;	**176 ;**	no drawing.
pentaphylla ...	**2,**381 ;	364 ;	**145 ;**	Pl. Corom. 84.
scandens ...	**2,**380 ;	363 ;	**1153** & **2056.**	
Limosella 1713				
diandra	**3,**91 ;	488 ;	**665.**	
Lindsaea				
bipinnata ...	— ;	760 ;	— ;	no drawing.
odorata	— ;	760 ;	**2578 ;**	No. 2568 on drawing.
Linum 923				
trigynum ...	**2,**110 ;	277 ;	**1048.**	
usitatissimum ...	**2,**110 ;	277 ;	— ;	no drawing.
Liriodendron 1569				
grandiflora ...	**2,**653 ;	452 ;	**2288 ;**	Pl. Corom. 266 as *Magnolia pterocarpa.*
Lilifera ...	**2,**654 ;	452 ;	— ;	no drawing.
Lithospermum 603				
viridiflorum ...	**1,**455 ;	153 ;	**2120.**	
Lobelia 728				
nicotianifolia ...	**1,**506 ;	170 ;	— ;	no drawing.
radicans	**1,**507 ;	170 ;	**2451 ;**	No. 2452 on drawing.
trigona	**1,**506 ;	170 ;	**439.**	
Loeflingia 180				
indica	**1,**165 ;	55 ;	**535.**	
Lonicera 818				
quinquelocularis ...	**1,**538 ;	181 ;	— ;	no drawing.
Loranthus 811				
ampullaceus ...	**1,**552 ;	185 ;	**2220.**	
	2,189 ;	302.		

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Loranthus—*continued*				
bicolor	**1,548 ; 2,185 ;**	184 ; 301.	**206 ;**	Pl. Corom. 139 ; in addition to the regular No. 206, there is also a drawing belonging to the set which is usually unnumbered, but this has the number 206 in pencil ; it differs somewhat from No. 206.
clavatus ...	**1,553 ; 2,189 ;**	186 ; 303.	— ;	no drawing.
ferrugineus ...	**1,551 ; 2,188 ;**	185 ; 302.	— ;	no drawing.
globosus	**1,550 ; 2,187 ;**	185 ; 302.	**933.**	
involucratus ...	**1,552 ; 2,188 ;**	185 ; 302.	**2222.**	
pentapetalus ...	**1,553 ; 2,190 ;**	186 ; 303.	**2221.**	
Scurrula ...	**1,550 ; 2,186 ;**	185 ; 302.	**207 ;**	Pl. Corom. 140.
Ludia 1377				
foetida	**2,508 ;**	405 ;	**2509 ;**	No. 2506 on drawing.
spinosa	**2,507 ;**	405 ;	**2266.**	
Ludwigia 464				
parviflora ...	**1,419 ;**	140 ;	**1340.**	
prostrata ...	**1,420 ;**	141 ;	**1945 ;**	Wight Ic. 962.
Luffa 2464				
acutangula ...	**3,713 ;**	698 ;	**458.**	
amara	**3,715 ;**	699 ;	**460.**	
Bindaal	**3,717 ;**	699 ;	— ;	no drawing.
clavata	**3,714 ;**	698 ;	**1692.**	
echinata ...	**3,716 ;**	699 ;	**1694.**	
graveolens ...	**3,716 ;**	699 ;	**1693.**	
pentandra ...	**3,712 ;**	698 ;	**459.**	
racemosa ...	**3,715 ;**	699 ;	— ;	no drawing.
tuberosa ...	**3,717 ;**	699 ;	**461.**	
Lycopodium				
aristatum ...	— ;	746 ;	— ;	no drawing.
cernuum ...	— ;	746 ;	— ;	no drawing.
filiforme	— ;	746 ;	— ;	no drawing.
furcatum ...	— ;	747 ;	— ;	no drawing.
imbricatum ...	— ;	747 ;	— ;	no drawing.
laevigatum ...	— ;	747 ;	— ;	no drawing.
mimosoides ...	— ;	747 ;	— ;	no drawing.
pectinatum ...	— ;	747 ;	— ;	no drawing.
pendulum ...	— ;	746 ;	— ;	no drawing.
Phlegmaria ...	— ;	746 ;	**1008.**	
plumosum ...	— ;	747 ;	— ;	no drawing.
rotundifolium ...	— ;	746 ;	— ;	no drawing.
Lycopus 158				
dianthera ...	**1,144 ;**	48 ;	**1517.**	
Macrocnemum 738				
parviflorum ...	**1,525 ;**	176 ;	— ;	no drawing.
stipulaceum ...	**1,525 ;**	176 ;	— ;	no drawing.
Magnolia 1570				
fuscata	2,655 ;	453 ;	**2289.**	
obovata ...	**2,655 ;**	453 ;	**953.**	
pterocarpa ...	**2,653 ;**	452 ;	**2288 ;**	Pl. Corom. 266 ; in Flora Indica as *Liriodendron grandiflora.*
pumila	**2,655 ;**	452 ;	**952.**	

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Malaxis 2175				
plicata	**3,**456 ;	611 ;	**1904.**	
Malva 1833				
Mauritiana ...	**3,**181 ;	519 ;	**670.**	
rotundifolia ...	**3,**181 ;	519 ;	— ;	no drawing.
Mangifera 861				
indica	**1,**641 ;	215 ;	**69.**	
oppositifolia ...	**1,**640 ;	215 ;	**2190.**	
sylvatica ...	**1,**644 ;	216 ;	**2189.**	
Manisuris 394				
granularis ...	**1,**352 ;	118 ;	**864 ;**	Pl. Corom. 118.
Myurus	**1,**351 ;	118 ;	**863 ;**	Pl. Corom. 117.
Marattia				
pinnata	— ;	763 ;	— ;	no drawing.
Marlea 1088				
begonifolia ...	**2,**261 ;	326 ;	**2228 ;**	Pl. Corom. 283.
Marsilea				
quadrifolia ...	— ;	745 ;	**1300.**	
Matricaria 2151				
suaveolens ...	**3,**437 ;	605 ;	— ;	no drawing.
Medicago 2098				
polymorpha ...	**3,**390 ;	589 ;	— ;	no drawing.
Melaleuca 2104				
Cajuputi ...	**3,**394 ;	590 ;	**2139.**	
Leucadendron ...	**3,**397 ;	591 ;	— ;	no drawing ; species described
	3,398 ;	592 ;	— ;	twice in Flora Indica.
rigida	**3,**399 ;	592 ;	— ;	no drawing.
viridiflora ...	**3,**398 ;	591 ;	**1631.**	
Melastoma 1256				
cernua	**2,**404 ;	372 ;	**2493 ;**	No. 2490 on drawing.
cordifolia ...	**2,**405 ;	372 ;	— ;	no drawing.
crinita	**2,**402 ;	371 ;	**2491 ;**	No. 2488 on drawing.
curva	**2,**406 ;	372 ;	— ;	no drawing; in Roxburgh's Flora Indica MS. the name is *M. curuva.*
decemfida ...	**2,**406 ;	372 ;	— ;	no drawing.
dodecandra ...	**2,**406 ;	372 ;	— ;	no drawing.
ferruginea ...	**2,**402 ;	371 ;	— ;	no drawing.
furcata	**2,**406 ;	372 ;	— ;	no drawing.
geniculata ...	**2,**403 ;	371 ;	**1139.**	
impuber ...	**2,**405 ;	372 ;	— ;	no drawing.
malabathrica ...	**2,**405 ;	372 ;	**154.**	
pulchella ...	**2,**403 ;	371 ;	**2490 ;**	No. 2487 on drawing.
vagans	**2,**404 ;	372 ;	**2492 ;**	No. 2489 on drawing.
Melia 1250				
azadirachta ...	**2,**394 ;	368 ;	**94.**	
Azedarak ...	**2,**395 ;	369 ;	**1968.**	
robusta	**2,**397 ;	369 ;	**1969.**	
sempervirens ...	**2,**395 ;	369 ;	**643.**	
superba	**2,**396 ;	369 ;	**2057.**	
tomentosa ...	**2,**394 ;	368 ;	**1430.**	

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Melica 367				
diandra	**1**,327 ;	110 ;	**826.**	
digitata	**1**,326 ;	110 ;	**825 ;**	also an unnumbered drawing greatly resembling No. 825.
latifolia	**1**,328 ;	110 ;	**2175.**	
refracta	**1**,327 ;	110 ;	**1329.**	
Melicope 1048				
tetrandra ...	**2**,257 ;	324 ;	**1411.**	
Melochia 1778				
corchorifolia ...	**3**,139 ;	505 ;	— ;	no drawing.
Melodinus 623				
monogynus ...	**2**,56 ;	259 ;	**2207 ;**	Wight Ic. 394.
Memecylon 1087				
amplexicaulis ...	**2**,260 ;	325 ;	**1055.**	
edule	**2**,260 ;	325 ;	**93 ;**	Pl. Corom. 82.
Menispermum 2576				
Cocculus ...	**3**,807 ;	730 ;	— ;	no drawing.
Columba ...	**3**,807 ;	730 ;	**2568 ;**	No. 2559 on drawing.
cordifolium ...	**3**,811 ;	731 ;	**128.**	
fenestratum ...	**3**,809 ;	731 ;	**1709.**	
heteroclitum ...	**3**,817 ;	733 ;	**130.**	
hexagynum ...	**3**,816 ;	733 ;	**2569 ;**	No. 2560 on drawing.
hirsutum ...	**3**,814 ;	732 ;	**129.**	
laurifolium ...	**3**,815 ;	733 ;	**2570 ;**	No. 2561 on drawing.
polycarpon ...	**3**,816 ;	733 ;	**131.**	
tomentosum ...	**3**,813 ;	732 ;	**1710.**	
triandrum ...	**3**,816 ;	733 ;	**1711.**	
verrucosum ...	**3**,808 ;	730 ;	**1708.**	
villosum	**3**,812 ;	732 ;	— ;	no drawing.
Mentha 1596				
auricularia ...	**3**,4 ;	459 ;	— ;	no drawing.
fruticosa ...	**3**,6 ;	460 ;	**2526.**	
paniculata ...	**3**,4 ;	459 ;	— ;	no drawing.
perilloides ...	**3**,7 ;	460 ;	**1569.**	
quadrifolia ...	**3**,5 ;	459 ;	**301 ;**	also an unnumbered drawing, different from No. 301.
sativa	**3**,6 ;	460 ;	— ;	no drawing.
secunda ...	**3**,6 ;	460 ;	**1251 ;**	the name *M. secunda* was omitted from Flora Indica by some error —it should be inserted after *M. fruticosa* immediately below the line which reads " A native of the Circar mountains."
stellata	**3**,5 ;	460 ;	— ;	no drawing.
verticillata ...	**3**,5 ;	460 ;	**957.**	
Menyanthes 534				
cristata ...	**1**,459 ;	154 ;	**553 ;**	Pl. Corom. 105.
indica	**1**,461 ;	155 ;	**1122.**	
Mespilus 1380				
bengalensis ...	**2**,510 ;	406 ;	— ;	no drawing.
japonica ...	**2**,510 ;	406 ;	**948.**	
Mesua 1517				
ferrea	**2**,605 ;	437 ;	**1080.**	

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Metrosideros 1343				
comosa	2,478 ;	396 ;	— ;	no drawing.
linearis	2,479 ;	396 ;	**1851.**	
suberosa ...	2,478 ;	396 ;	— ;	no drawing.
vera	2,477 ;	395 ;	**1559 ;**	also an unnumbered drawing lacking three dissections but otherwise a replica of No. 1559.
Michelia 1571				
champaca ...	2,656 ;	453 ;	**1071.**	
Milium 352				
filiforme	1,314 ;	105 ;	**815.**	
ramosum ...	1,315 ;	106 ;	**818.**	
sanguinale ...	1,315 ;	106 ;	**816.**	
Millingtonia 110				
pinnata	1,104 ;	35 ;	**2105.**	
simplicifolia ...	1,103 ;	35 ;	**2104 ;**	Pl. Corom. 254.
Milnea 829				
edulis	1,637 ;	214 ;	**2188.**	
Mimosa 1444				
adenanthera ...	2,554 ;	420 ;	**1864.**	
amara	2,548 ;	418 ;	**486 ;**	Pl. Corom. 122 ; also a drawing of the usually unnumbered set, but this one bears the number 486—it differs, however, from No. 486.
arabica	2,558 ;	421 ;	**489 ;**	Pl. Corom. 149.
biglobosa ...	2,551 ;	419 ;	**2515 ;**	No. 2510 on drawing.
caesia	2,565 ;	424 ;	**500.**	
Catechu	2,563 ;	423 ;	**1725 ;**	Pl. Corom. 175.
catechuoides ...	2,562 ;	423 ;	**495.**	
cinerea	2,561 ;	422 ;	**493 ;**	Pl. Corom. 174.
concinna ...	2,565 ;	424 ;	**498.**	
concordiana ...	2,556 ;	421 ;	**1003.**	
dulcis	2,556 ;	421 ;	**488 ;**	Pl. Corom. 99.
dumosa	2,559 ;	422 ;	— ;	no drawing.
eburnea ...	2,558 ;	421 ;	**491 ;**	Pl. Corom. 199.
elata	2,546 ;	418 ;	**1722.**	
Farnesiana ...	2,557 ;	421 ;	**492.**	
fera	2,560 ;	422 ;	**1097.**	
ferruginea ...	2,561 ;	423 ;	**494.**	
fruticosa ...	2,549 ;	418 ;	— ;	no drawing.
heterophylla ...	2,545 ;	417 ;	**2273.**	
Intsia	2,565 ;	424 ;	**499.**	
koeringa ...	2,543 ;	416 ;	— ;	no drawing ; in Roxburgh's Flora Indica MS. the name is *M. Djiringa* and it is said to be "called Djiringa by the Malays."
Kalkora	2,547 ;	418 ;	— ;	no drawing.
latronum ...	2,559 ;	422 ;	**1724.**	
leucophloea ...	2,558 ;	421 ;	**490 ;**	Pl. Corom. 150.
lucida	2,544 ;	417 ;	**1863.**	
microphylla ...	2,549 ;	419 ;	**2275.**	
monadelpha ...	2,544 ;	417 ;	— ;	no drawing.
mutabilis ...	2,564 ;	423 ;	— ;	no drawing.
natans	2,553 ;	420 ;	**487 ;**	Pl. Corom. 119.
obovata ...	2,561 ;	422 ;	— ;	no drawing.
octandra ...	2,564 ;	423 ;	**497 ;**	Pl. Corom. 200.
odoratissima ...	2,546 ;	418 ;	**484 ;**	Pl. Corom. 120.
pedunculata ...	2,551 ;	419 ;	— ;	no drawing.
pennata ...	2,566 ;	424 ;	**1866.**	

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Mimosa—*continued*				
procera	**2,548** ;	418 ;	**485** ;	Pl. Corom. 121.
pudica	**2,564** ;	423 ;	— ;	no drawing.
pulchella ...	**2,548** ;	418 ;	— ;	no drawing.
scandens ...	**2,554** ;	420 ;	**2272.**	
Sirissa	**2,544** ;	417 ;	**483.**	
Smithiana ...	**2,550** ;	419 ;	**2274.**	
stipulacea ...	**2,549** ;	418 ;	**1723.**	
Suma	**2,563** ;	423 ;	**1867.**	
sundra ...	**2,562** ;	423 ;	**496** ;	Pl. Corom. 225.
tomentosa ...	**2,558** ;	422 ;	**1096.**	
torta	**2,566** ;	424 ;	**1865.**	
trapezifolia ...	**2,546** ;	417 ;	— ;	no drawing.
triquetra ...	**2,552** ;	420 ;	**2514** ;	No. 2509 on drawing.
xylocarpa ...	**2,543** ;	417 ;	**482** ;	Pl. Corom. 100.
Mimusops 1061				
elengi	**2,236** ;	318 ;	**115** ;	Pl. Corom. 14.
hexandra ...	**2,238** ;	318 ;	**116** ;	Pl. Corom. 15.
kanki	**2,238** ;	318 ;	**2482** ;	No. 2480 on drawing.
Moacurra 906				
gelonioides ...	**2,69** ;	264 ;	**2212.**	
Moalmurreah ...	— ;	— ;	**2441** ;	No. 2440 on drawing which, like the description in the Kew MS., is under the vernacular name 'Moalmurreah' ; the plant is *Itea macrophylla* Wall. but it seems to have been omitted from Flora Indica (1832).
Modecca 1769				
dubia	**3,135** ;	503 ;	**2310.**	
trilobata ...	**3,132** ;	503 ;	**2308** ;	Pl. Corom. 297.
tuberosa ...	**3,134** ;	503 ;	**2309.**	
Molinaea 1068				
canescens ...	**2,243** ;	320 ;	**90** ;	Pl. Corom. 60.
laevis	**2,244** ;	320 ;	— ;	no drawing.
Mollugo 403				
pentaphylla ...	**1,359** ;	121 ;	— ;	no drawing.
triphylla ...	**1,360** ;	121 ;	— ;	no drawing.
verticillata ...	**1,360** ;	121 ;	— ;	no drawing.
Momordica 2459				
calcarata ...	— ;	— ;	— ;	under this name there is a drawing inscribed " Ic. Roxburgh " which is referred to as such by C. B. Clarke in Fl. Brit. India II. 631 (1879), it represents *Thladiantha calcarata* (Colebr.) C. B. Cl. and is doubtfully a Roxburgh drawing.
charantia ...	**3,707** ;	696 ;	— ;	no drawing.
dioica	**3,709** ;	696 ;	**455.**	
mixta	**3,710** ;	697 ;	**993.**	
monadelpha ...	**3,708** ;	696 ;	**213.**	
muricata ...	**3,707** ;	696 ;	— ;	no drawing.
tubiflora ...	**3,711** ;	697 ;	**1696** ;	drawing named *Cucumis tubiflora* Roxb.
umbellata ...	**3,710** ;	697 ;	**470.**	

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Monetia 2526 barlerioides ...	**3,**765 ;	716 ;	**132.**	
Morea 185 chinensis ...	**1,**170 ;	57 ;	— ;	no drawing.
Morinda 788 angustifolia ...	**1,**547 ;	184 ;	**1219 ;**	drawing missing ; Pl. Corom. 237 ; there is an unnumbered drawing which is almost identical with t. 237.
bracteata ...	**1,**544 ;	183 ;	**1367.**	
citrifolia	**1,**541 ;	182 ;	**2181.**	
exserta	**1,**545 ;	183 ;	**1365.**	
multiflora ...	**1,**546 ;	183 ;	**1366.**	
scandens ...	**1,**548 ;	184 ;	— ;	there is a drawing of this numbered 2570, but in the Kew MS. this number belongs to *Menispermum laurifolium*, and *Morinda scandens* is not described.
tinctoria ...	**1,**543 ;	182 ;	**918.**	
Morus 2331 alba	**3,**594 ;	658 ;	**2143.**	
atropurpurea ...	**3,**595 ;	658 ;	**2142 ;**	Wight Ic. 677.
indica	**3,**596 ;	658 ;	**1674 ;**	Wight Ic. 674.
mauritiana ...	**3,**599 ;	659 ;	**1703 ;**	drawing named *Trophis cylindrica* Roxb. ; in the Kew MS. Roxburgh has changed the name to *Morus mauritiana*.
paniculata ...	**3,**599 ;	660 ;	**1675 ;**	Wight Ic. 676.
serrata	**3,**596 ;	658 ;	— ;	no drawing.
tatarica	**3,**598 ;	659 ;	— ;	Wight Ic. 675 ; an unnumbered drawing agrees with Wight's t. 675.
Murraya 1226 exotica	**2,**374 ;	362 ;	**48.**	
Sumatrana ...	**2,**375 ;	362 ;	— ;	no drawing.
Musa 502 coccinea ...	**1,**665 ;	223 ;	**1298.**	
glauca	**1,**669 ;	224 ;	**2191 ;**	Pl. Corom. 300.
ornata	**1,**666 ;	223 ;	**1716 ;**	the drawing lacks the number but bears an ' Icones Roxburghianae ' label.
sapientum ...	**1,**663 ;	222 ;	**1808 ;**	Pl. Corom. 275.
superba	**1,**667 ;	224 ;	**1715 ;**	drawing missing ; Pl. Corom. 223 ; there is an unnumbered drawing which greatly resembles Pl. Corom. 223.
Mussaenda 714 corymbosa ...	**1,**556 ;	187 ;	**1220 ;**	the drawing is named *M. frondosa* but it agrees with the description of No. 1220 *M. corymbosa* in the Kew MS, which is the description in Flora Indica.
frondosa ...	**1,**557 ;	187 ;	— ;	there is an unnumbered drawing named, in ink, *M. frondosa*, but the trivial is crossed through and ' corymbosa ' substituted, in pencil, in Roxburgh's writing ; the drawing differs from No. 1220, and agrees with the account of *M. frondosa* in Flora Indica—so far as it goes.

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Myrica 1527				
integrifolia ...	**3**,765 ;	716 ;	**2562 ;**	No. 2555 on drawing ; Wight Ic. 764, 765.
Myriophyllum 498				
tetrandrum ...	**1**,451 ;	151 ;	**551.**	
tuberculatum ...	**1**,451 ;	151 ;	**1347 ;**	drawing named *Potamogeton tuberculatum* Roxb.
Myristica 2617				
angustifolia ...	**3**,847 ;	744 ;	**2572 ;**	No. 2562 on drawing.
aromatica ...	**3**,843 ;	742 ;	**1714 ;**	Pl. Corom. 267 ; in Flora Indica as *M. moschata*.
linifolia	**3**,847 ;	744 ;	— ;	no drawing.
macrophylla ...	**3**,846 ;	743 ;	— ;	no drawing.
montana ...	**3**,846 ;	743 ;	**2575 ;**	No. 2565 on drawing.
moschata ...	**3**,843 ;	742 ;	**1714 ;**	Pl. Corom 267 as *M. aromatica* which is the name on the drawing.
parviflora ...	**3**,847 ;	744 ;	**2574 ;**	No. 2564 on drawing.
peltata	**3**,846 ;	743 ;	**2573 ;**	No. 2563 on drawing.
salicifolia ...	**3**,847 ;	743 ;	— ;	no drawing.
spicata	**3**,847 ;	744 ;	— ;	no drawing.
Myrtus 1367				
canescens ...	**2**,498 ;	402 ;	— ;	no drawing.
communis ...	**2**,497 ;	402 ;	— ;	no drawing.
Pimenta angustifolia	— ;	— ;	**1441a**	West Indian plants introduced into India ; not included in Fl. Indica.
Pimenta latifolia	— ;	— ;	**1441b**	
tomentosa ...	**2**,298 ;	402 ;	**1442.**	
Nageia 2528				
Putranjiva ...	**3**,767 ;	716 ;	**123** & **2146.**	
Najas 2509				
dichotoma ...	**3**,749 ;	710 ;	— ;	no drawing.
Nama 601				
zeylanica ...	**2**,73 ;	265 ;	**590 ;**	Wight Ic. 601.
Nandina 1005				
domestica ...	**2**,184 ;	301 ;	— ;	no drawing.
Nauclea 796				
Cadamba ...	**1**,512 ;	172 ;	**917 ;**	No. 907 on drawing, evidently by error.
cordata	**1**,509 ;	171 ;	**1796 ;**	also an unnumbered drawing which is a replica of No. 1796 except that a number of dissections are omitted.
cordifolia ...	**1**,514 ;	172 ;	**62 ;**	Pl. Corom. 53.
glabra	**1**,513 ;	172 ;	— ;	no drawing.
macrophylla ...	**1**,511 ;	171 ;	**2122.**	
ovalifolia ...	**1**,516 ;	173 ;	— ;	no drawing.
parvifolia ...	**1**,513 ;	172 ;	**61 ;**	Pl. Corom. 52.
purpurea ...	**1**,515 ;	173 ;	**63 ;**	Pl. Corom. 54.
rotundifolia ...	**1**,516 ;	173 ;	— ;	no drawing.
sessilifolia ...	**1**,515 ;	173 ;	— ;	no drawing.
tetrandra ...	**1**,516 ;	173 ;	**2436.**	
undulata ...	**1**,508 ;	171 ;	**1953.**	
Nectandra 1286				
decandra ...	**2**,425 ;	378 ;	**2494.**	
Neerija 866				
dichotoma ...	**1**,646 ;	217 ;	**73.**	

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Nelumbium 1562				
speciosum ...	**2**,647 ;	450 ;	**663**	(2 drawings), **664 ;** one of drawings numbered 663 shows leaves and fruits the other has pink flowers, while 664 shows white flowers.
Nerium 651				
caudatum ...	**2**,9 ;	244 ;	**211 ;**	Wight Ic. 599.
chinense ...	**2**,9 ;	244 ;	— ;	no drawing.
coccineum ...	**2**,2 ;	242 ;	**2205 ;**	Wight Ic. 442.
grandiflorum ...	**2**,10 ;	245 ;	**1957.**	
odorum	**2**,2 ;	242 ;	— ;	no drawing.
pauciflorum ...	— ;	— ;	**605 ;**	Wight Ic. 493 as *Cryptolepis ? pauciflora* ; the species was omitted from Flora Indica probably because it was missing in Carey's copy of the MS., like the beginning of *Echites*, which follows it immediately in Roxburgh's MS.
pisidium ...	**2**,7 ;	244 ;	**2204.**	
reticulatum ...	**2**,8 ;	244 ;	**604 ;**	Wight Ic. 494.
tinctorium ...	**2**,4 ;	243 ;	**18 ;**	Wight Ic. 444.
tomentosum ...	**2**,6 ;	243 ;	**210 ;**	Wight Ic. 443.
New Genus ...	**2**,225 ;	314 ;	**1133 ;**	Roxburgh referred this to the Linnean class Octandria monogynia, but did not name it ; in Hook. f. Fl. Brit. Ind. **2**,551 (1879) it is named *Pternandra coerulescens.*
Nigella 1561				
indica	**2**,646 ;	450 ;	**1146.**	
Nipa 2393				
fruticans ...	**3**,650 ;	677 ;	— ;	no drawing.
Nyctanthes 93				
arbor-tristis ...	**1**,86 ;	29 ;	**179.**	
Nymphaea 1483				
cyanea	**2**,577 ;	428 ;	**659.**	
esculenta ...	**2**,578 ;	428 ;	**660.**	
Lotus	**2**,577 ;	428 ;	**658.**	
rubra	**2**,576 ;	427 ;	**657.**	
stellata	**2**,579 ;	428 ;	**1862.**	
versicolor ...	**2**,577 ;	428 ;	— ;	no drawing.
Ochna 1558				
squarrosa ...	**2**,643 ;	449 ;	**173 ;**	drawing missing ; Pl. Corom. 89.
Ocymum 1608				
album	**3**,15 ;	463 ;	— ;	no drawing.
basilicon ...	**3**,17 ;	464 ;	— ;	no drawing.
bullatum ...	**3**,15 ;	463 ;	— ;	no drawing ; treated as a distinct species by error, for in Roxburgh's Flora IndicaMS. it is a synonym of his *O. album* and the text under *bullatum* refers to *O. album.*
caryophyllatum ...	**3**,16 ;	463 ;	**1255 ;**	drawing named " Ocymum Goolal-tulasi ".
cristatum ...	**3**,19 ;	464 ;	**312.**	
gratissimum ...	**3**,17 ;	464 ;	**1257 ;**	drawing named " Ocymum Ramtulasi ".
inodorum ...	**3**,19 ;	465 ;	**313.**	

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Ocymum—*continued*				
pilosum	**3**,16 ;	464 ;	**1256.**	
polystachyum ...	**3**,18 ;	464 ;	**310.**	
sanctum	**3**,14 ;	463 ;	**309.**	
thyrsiflorum ...	**3**,15 ;	463 ;	**1870.**	
tuberosum ...	**3**,18 ;	464 ;	**311 ;**	also an unnumbered drawing which is different from No. 311.
villosum	**3**,14 ;	463 ;	**1253 ;**	drawing named *Ocymum gratissimum*, but it is different from No. 1257 which is the plant Roxburgh described under that name.
Odina 1125				
Wodier	**2**,293 ;	336 ;	**172.**	
Olax 179				
imbricata ...	**1**,164 ;	55 ;	— ;	no drawing.
scandens ...	**1**,163 ;	55 ;	**532 ;**	Pl. Corom. 102.
Oldenlandia 466				
alata	**1**,421 ;	141 ;	**547.**	
biflora	**1**,423 ;	142 ;	**1342** & **2177.**	
crystallina ...	**1**,422 ;	142 ;	**1117.**	
diffusa	**1**,423 ;	142 ;	**1341.**	
herbacea ...	**1**,424 ;	142 ;	**546.**	
paniculata ...	**1**,422 ;	141 ;	**1343.**	
ramosa	**1**,424 ;	142 ;	**1946 ;**	Wight Ic. 822.
umbellata ...	**1**,421 ;	141 ;	**39 ;**	Pl. Corom. 3.
Olea 112				
dioica	**1**,106 ;	36 ;	**2165.**	
fragrans ...	**1**,105 ;	35 ;	— ;	no drawing.
paniculata ...	**1**,105 ;	35 ;	**507 ;**	Wight Ic. 735.
Ophioglossum				
cordifolium ...	— ;	747 ;	**1199.**	
filiforme	— ;	748 ;	**1741,**	
flexuosum ...	— ;	748 ;	— ;	no drawing.
furcatum ...	— ;	748 ;	— ;	no drawing.
scandens ...	— ;	748 ;	**1200.**	
Ophiorrhiza 752				
Mungos ...	**1**,701 ;	235 ;	**1212.**	
villosa	**1**,702 ;	236 ;	**2439 ;**	No. 2438 on drawing.
Ophioxylon 635				
serpentinum ...	**1**,694 ;	233 ;	**137.**	
Opilia 859				
amentacea ...	**2**,87 ;	269 ;	**189 ;**	Pl. Corom. 158.
Orchis 2167				
commelinaefolia ...	**3**,451 ;	609 ;	**2334.**	
plantaginea ...	**3**,450 ;	609 ;	**237.**	Pl. Corom. 37. Roxburgh originally had his No. 237 as *Orchis plantaginea* Roxb. and under this name the plate and description were published in Pl. Corom. He had *O. platyphyllos* L. as a synonym but in the Kew MS. he has transposed the two names, i.e. he accepted *O. platyphyllos* L. as the name for his plant. In Flora Indica two species are made out of the one and this is followed in Fl. Brit. Ind. **4,** 140, 141 (1890).
platyphyllos ...	**3**,450 ;	609 ;	**237.**	
uniflora	**3**,452 ;	610 ;	**2335.**	

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Ornitrophe 1092				
aporetica ...	2,264 ;	327 ;	**2050.**	
Cobbe	2,268 ;	328 ;	— ;	no drawing.
glabra	2,267 ;	327 ;	**1405.**	
integrifolia ...	2,268 ;	328 ;	— ;	no drawing.
repanda	2,269 ;	328 ;	— ;	no drawing.
serrata	2,266 ;	327 ;	**91 ;**	Pl. Corom. 61.
villosa	2,265 ;	327 ;	**2484 ;**	Wight Ic. 401.
Orobanche 1627				
acaulis	3,28 ;	468 ;	**1467 ;**	Pl. Corom. 292.
indica	3,27 ;	467 ;	**1261.**	
pedunculata ...	3,29 ;	468 ;	**1466.**	
Oryza 1022				
coarctata ...	2,206 ;	308 ;	**1132.**	
sativa	2,200 ;	306 ;	**869 ;**	there is an unnumbered drawing greatly resembling No. 869, and two others inscribed respectively Division 1st and Division 2nd, evidently referring to the account in Roxburgh's MS.
Osbeckia 1047				
chinensis ...	2,224 ;	314 ;	— ;	no drawing.
tetrandra ...	2,224 ;	314 ;	**1118.**	
zeylanica ...	2,223 ;	314 ;	**1233.**	
Osmunda				
lanceolata ...	— ;	748 ;	**694.**	
zeylanica ...	— ;	748 ;	**1742.**	
Osyris 2515				
peltata	3,755 ;	712 ;	**125 ;**	Wight Ic. 817.
Oxalis 1319				
corniculata ...	2,457 ;	389 ;	**1433.**	
pusilla	2,457 ;	389 ;	— ;	no drawing ; Roxburgh did not have this as a distinct species and in his Flora Indica MS. it is clearly a synonym of *O. corniculata*, to which the text under *O. pusilla* refers.
sensitiva	2,457 ;	389 ;	**1244.**	
Paederia 784				
erecta	1,685 ;	230 ;	**2196.**	
foetida	1,683 ;	229 ;	**1030.**	
recurva	1,684 ;	230 ;	**2197.**	
Panax 818				
conchifolium ...	2,77 ;	266 ;	— ;	no drawing.
digitatum ...	2,75 ;	265 ;	**2049.**	
fragrans ...	2,76 ;	266 ;	**2209.**	
fruticosum ...	2,76 ;	266 ;	**1389 ;**	Wight Ic. 573.
palmatum ...	2,74 ;	265 ;	**2208.**	
Pancratium 939				
biflorum ...	2,125 ;	282 ;	**1960.**	
longiflorum ...	2,124 ;	282 ;	**1959 ;**	*Pancratum uniflorum* on drawing.
triflorum ...	2,126 ;	282 ;	**1049.**	
zeylanicum ...	2,124 ;	282 ;	**1547.**	
Pandanus 2495				
amaryllifolius ...	3,743 ;	708 ;	— ;	no drawing.

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Pandanus—*continued*				
foetidus	3,742 ;	708 ;	**994** & **995.**	
furcatus ...	3,744 ;	708 ;	— ;	no drawing.
inermis ...	3,744 ;	708 ;	— ;	no drawing.
odoratissimus ...	3,738 ;	707 ;	**472, 473** & **474 ;**	Pl. Corom. 94, 95, 96.
Panicum 313				
aegyptiacum ...	1,289 ;	97 ;	**801.**	
barbatum ...	1,282 ;	94 ;	**1325.**	
brevifolium ...	1,306 ;	103 ;	**804.**	
brizoides ...	1,293 ;	98 ;	**789.**	
Burmanni ...	1,295 ;	99 ;	**792.**	
ciliare	1,290 ;	97 ;	**788.**	
cimicinum ...	1,291 ;	98 ;	**817.**	
colonum ...	1,296 ;	99 ;	**795 ;**	*P. crus-corvi* on verso of drawing, evidently by error, for the drawing is No. 795 and agrees with the description under that number ; also an unnumbered drawing quite different from No. 795.
conjugatum ...	1,288 ;	97 ;	**2024.**	
corymbosum ...	1,292 ;	98 ;	**800.**	
costatum ...	1,312 ;	105 ;	**1777.**	
Crus-corvi ...	1,296 ;	99 ;	**794 ;**	*P. colonum* on verso of drawing, evidently by error, for the drawing is numbered 794 and agrees with the description under that number.
curvatum ...	1,286 ;	96 ;	**782 ;**	also an unnumbered drawing quite different from No. 782.
cuspidatum ...	1,298 ;	100 ;	**2027.**	
Dactylon ...	1,289 ;	97 ;	**819.**	
dimidiatum ...	1,287 ;	96 ;	**2026.**	
filiforme	1,290 ;	97 ;	**2025.**	
fluitans ...	1,293 ;	99 ;	**790.**	
frumentaceum ...	1,304 ;	102 ;	**808.**	
glaucum ...	1,284 ;	95 ;	**783.**	
grossarium ...	1,297 ;	100 ;	**796 ;**	also two unnumbered drawings (one of them marked " bad " by Roxburgh) which resemble No. 796 quite considerably and, like it are named *P. repens*, this being the original name in the Kew MS. where it has been changed to *P. grossarium* by Roxburgh.
hirsutum ...	1,300 ;	101 ;	**799.**	
hispidulum ...	1,303 ;	102 ;	**1327.**	
holcoides ...	1,285 ;	96 ;	**784.**	
indicum	1,281 ;	94 ;	**2424.**	
interruptum ...	1,286 ;	96 ;	**781.**	
involucratum ...	1,284 ;	95 ;	**896.**	
italicum	1,302 ;	101 ;	**786.**	
lanceolatum ...	1,294 ;	99 ;	**791.**	
lineare	1,291 ;	98 ;	**2029.**	
miliaceum ...	1,310 ;	104 ;	**811.**	
miliare	1,309 ;	104 ;	**809** & **810.**	
montanum ...	1,313 ;	105 ;	**813.**	
nervosum ...	1,311 ;	105 ;	**1776.**	
paludosum ...	1,307 ;	103 ;	**806.**	
patens	1,305 ;	103 ;	**803.**	
plicatum ...	1,311 ;	104 ;	**1328.**	
repens	1,299 ;	101 ;	**2028.**	
sarmentosum ...	1,308 ;	104 ;	**1788 ;**	also an unnumbered drawing virtually identical with No. 1778.

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Panicum—*continued*				
serrulatum ...	1,307 ;	103 ;	**805 ;**	in the Kew MS. the epithet is *serratulum.*
setigerum ...	1,299 ;	100 ;	**798.**	
spicatum ...	1,283 ;	95 ;	**895.**	
squarrosum ...	1,288 ;	97 ;	**858 ;**	Pl. Corom. 206.
stagninum ...	1,295 ;	99 ;	**793 ;**	also an unnumbered drawing identical in part with No. 793.
strictum	1,303 ;	102 ;	**1326.**	
tenellum ...	1,306 ;	103 ;	**814.**	
tenue	1,310 ;	104 ;	**812 ;**	drawing bears the name *Panicum miliacioides* as in the Kew MS.
tomentosum ...	1,301 ;	101 ;	**787 ;**	also an unnumbered drawing nearly identical with No. 787.
trigonum ...	1,305 ;	102 ;	**802.**	
uliginosum ...	1,308 ;	103 ;	**807.**	
umbrosum ...	1,297 ;	100 ;	**797 ;**	also an unnumbered drawing which is different from No. 797.
verticillatum ...	1,301 ;	101 ;	**785.**	
Papaver 1477				
somniferum ...	2,571 ;	426 ;	— ;	no drawing.
Paspalum 309				
kora	1,279 ;	93 ;	**778.**	
longiflorum ...	1,279 ;	94 ;	**779.**	
longifolium ...	1,280 ;	94 ;	**1775.**	
scrobiculatum ...	1,127 ;	93 ;	**777.**	
Pavonia 1873				
odorata	3,214 ;	530 ;	**354.**	
zeylanica ...	3,214 ;	530 ;	**353.**	
Pedalium 1745				
Murex	3,114 ;	496 ;	**9.**	
Pemphis 1327				
angustifolia ...	2,465 ;	391 ;	— ;	no drawing.
Pentapetes 1802				
phoenicea ...	3,157 ;	511 ;	**1077 ;**	also an unnumbered drawing which is a replica of No. 1077.
Pentaptera 1299				
angustifolia ...	2,437 ;	382 ;	**1845.**	
Arjuna	2,438 ;	382 ;	— ;	no drawing.
bialata	2,441 ;	383 ;	**1721.**	
coriacea	2,439 ;	383 ;	**1847.**	
crenulata ...	2,438 ;	383 ;	**1846.**	
glabra	2,440 ;	383 ;	**4.**	
paniculata ...	2,442 ;	384 ;	**2252.**	
tomentosa ...	2,440 ;	383 ;	**3.**	
Periploca				
esculenta ...	2,40 ;	254 ;	**217 ;**	Pl. Corom. 11 ; in Flora Indica as *Asclepias rosea.*
Perotis 257				
latifolia	1,233 ;	78 ;	**776 ;**	also an unnumbered drawing, identical in part with No. 776, but more extensive.
Petaloma 1224				
alternifolia ...	2,372 ;	361 ;	**1428.**	

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Petrocarya 1040				
Matoma ...	— ;	— ;	**2477 ;**	No. 2475 on drawing ; not in Flora Indica, presumably because it was an introduction from Mozambique ; it appears to be *Parinarium excelsum* D. Don.
Pharnaceum 919				
Mollugo ...	**2,**102 ;	275 ;	— ;	no drawing.
pentagynum ...	**2,**103 ;	275 ;	**1128.**	
Pharus 2350				
urceolata ...	**3,**611 ;	664 ;	**1175 ;**	no drawing.
Phaseolus 1973				
aconitifolius ...	**3,**299 ;	558 ;	**1159.**	
alatus	**3,**288 ;	554 ;	**277.**	
aureus	**3,**297 ;	557 ;	**1604.**	
calcaratus ...	**3,**289 ;	555 ;	**1602.**	
dolichoides ...	**3,**290 ;	555 ;	**1889 ;**	also an unnumbered drawing different from No. 1889.
glaber	**3,**291 ;	556 ;	**1603.**	
lunatus ...	**3,**287 ;	554 ;	**272.**	
Max	**3,**295 ;	557 ;	**274.**	
maximus ...	**3,**288 ;	554 ;	— ;	no drawing.
minimus ...	**3,**290 ;	555 ;	**2084.**	
Mungo ...	**3,**292 ;	556 ;	**273.**	
nanus	**3,**291 ;	556 ;	— ;	no drawing.
radiatus ...	**3,**296 ;	557 ;	**275.**	
sub-lobatus ...	**3,**288 ;	555 ;	**1158.**	
torosus	**3,**298 ;	558 ;	**1605.**	
trilobus	**3,**298 ;	558 ;	**276.**	
vulgaris	**3,**287 ;	554 ;	— ;	no drawing.
Phellandrium 913				
stoloniferum ...	**2,**93 ;	271 ;	**1044 ;**	Wight Ic. 571.
Phillyrea 108				
paniculata ...	**1,**100 ;	34 ;	**1309 ;**	Wight Ic. 736.
robusta	**1,**101 ;	34 ;	**2164.**	
Phleum 351				
crinitum ...	**1,**313 ;	105 ;	**1523.**	
Phlomis 1601				
biflora	**3,**12 ;	462 ;	**1073.**	
calycina	**3,**11 ;	462 ;	— ;	no drawing.
cephalotes ...	**3,**10 ;	461 ;	**307.**	
esculenta ...	**3,**10 ;	461 ;	**306.**	
moluccana ...	**3,**11 ;	462 ;	— ;	no drawing.
montana ...	**3,**11 ;	462 ;	**305.**	
nepetifolia ...	**3,**8 ;	461 ;	**303.**	
pilosa	**3,**12 ;	462 ;	**1457.**	
reptifolia ...	**3,**8 ;	461 ;	see *P. nepetifolia.*	
urticifolia ...	**3,**11 ;	462 ;	— ;	no drawing.
zeylanica ...	**3,**9 ;	461 ;	**304.**	
Phoenix 2547				
acaulis	**3,**783 ;	722 ;	**2150 ;**	Pl. Corom. 273.
dactylifera ..	**3,**786 ;	723 ;	— ;	no drawing.
farinifera ...	**3,**785 ;	722 ;	**78 ;**	Pl. Corom. 74.
paludosa ...	**3,**789 ;	724 ;	**1193.**	
sylvestris ...	**3,**787 ;	723 ;	**1192.**	

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Phrynium 13				
capitatum ...	1,8 ;	3 ;	**1305 ;**	also an unnumbered drawing almost identical with No. 1305.
dichotomum ...	1,2 ;	1 ;	**1013.**	
imbricatum ...	1,6 ;	2 ;	**2152.**	
parviflorum ...	1,7 ;	3 ;	**2151.**	
spicatum ...	1,5 ;	2 ;	**2101.**	
virgatum ...	1,4 ;	2 ;	**2001.**	
Phyllanthus 2397				
bacciformis ...	3,661 ;	681 ;	**260.**	
Emblica	3,671 ;	684 ;	**254.**	
gracilis	3,655 ;	679 ;	**266.**	
Kirganelia ...	3,668 ;	683 ;	**1912.**	
leucopyrus ...	3,658 ;	679 ;	**257.**	
longifolius ...	3,672 ;	684 ;	**268.**	
madraspatensis ...	3,654 ;	678 ;	**262.**	
multiflorus ...	3,664 ;	681 ;	**259.**	
Niruri	3,659 ;	680 ;	**261.**	
obcordatus ...	3,656 ;	679 ;	**1683.**	
patens	3,667 ;	682 ;	**1684 ;**	also an unnumbered drawing which is almost a replica of No. 1684—it bears the number 2096, which is the page of the "Original description", fide the British Museum Index to Roxburgh's MSS.
pendula ...	3,662 ;	681 ;	**265.**	
petiolaris ...	3,664 ;	681 ;	— ;	no drawing.
reclinatus ...	3,669 ;	683 ;	**2098.**	
retusus	3,657 ;	679 ;	**1911.**	
rhamnoides ...	3,663 ;	681 ;	**267.**	
simplex	3,655 ;	678 ;	**263 ;**	also a drawing of the usually unnumbered set, but this one has 263 in pencil—it differs, however, from No. 263.
strictus	3,670 ;	684 ;	**1685.**	
tenellus	3,668 ;	683 ;	**1913.**	
tetrandrus ...	3,674 ;	684 ;	**2396.**	
turbinatus ...	3,666 ;	682 ;	**255.**	
Urinaria ...	3,660 ;	680 ;	**264.**	
virosus	3,659 ;	680 ;	**256.**	
vitis-idaea ...	3,665 ;	682 ;	**258.**	
Physalis 547				
Alkekengi ...	1,562 ;	189 ;	— ;	no drawing.
flexuosa ...	1,561 ;	189 ;	**573.**	
minima	1,563 ;	189 ;	**919.**	
peruviana ...	1,562 ;	189 ;	— ;	no drawing.
Phyteuma 731				
begonifolium ...	1,505 ;	170 ;	— ;	no drawing.
Phytolacca 1230				
acinosa ...	2,458 ;	389 ;	**1556 ;**	also an unnumbered drawing, a replica of No. 1556.
Pierardia 1081				
sapida	2,254 ;	323 ;	**1234.**	
Pinus 2394				
Devdara ...	3,651 ;	677 ;	**1681 ;**	no drawing ; there is an unnumbered drawing which closely resembles the plate in Lambert Genus Pinus, 1832 ed., II. t. 52 A (1832).

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Pinus—*continued*				
longifolia ...	**3,**651 ;	677 ;	**1180 ;**	no drawing ; there is an unnumbered drawing.
Piper 164				
angustifolium ...	**1,**161 ;	54 ;	— ;	no drawing.
arborescens ...	**1,**159 ;	53 ;	— ;	no drawing.
Betle	**1,**158 ;	53 ;	**2167 ;**	Wight Ic. 1926 as *Chavica betle*.
Chaba	**1,**156 ;	52 ;	**1518 ;**	Wight Ic. 1927 as *Chavica peepuloides*.
Cubeba	**1,**159 ;	53 ;	— ;	no drawing.
diffusus	**1,**160 ;	54 ;	— ;	no drawing.
lanatum	**1,**159 ;	53 ;	— ;	no drawing.
lanceolatum ...	**1,**160 ;	54 ;	— ;	no drawing.
longum	**1,**154 ;	52 ;	**681 ;**	Wight Ic. 1928 as *Chavica Roxburghii*.
Malamiris ...	**1,**160 ;	54 ;	— ;	no drawing ; in Roxburgh's Flora Indica MS. the name is *P. malmaris*.
methysticum ...	**1,**159 ;	53 ;	- ;	no drawing.
nigrum ...	**1,**150 ;	51 ;	- ;	no drawing.
peepuloides ...	**1,**157 ;	53 ;	**2169.**	
rostratum ...	**1,**160 ;	54 ;	— ;	no drawing.
sarmentosum ...	**1,**160 ;	54 ;	**1519 ;**	Wight Ic. 1929 as *Chavica sarmentosa*.
saxatile	**1,**161 ;	54 ;	— ;	no drawing.
sylvaticum ...	**1,**156 ;	52 ;	**2168 ;**	Wight Ic. 1930.
trioicum ...	**1,**151 ;	51 ;	**34 ;**	Wight Ic. 1935–6 ; there are two drawings of No. 34 both named *P. nigrum* on the verso ; one shows male and female shoots and dissections and an infructescence ; the other has a similar male shoot, a different female and a different infructescence and in addition a hermaphrodite shoot and dissections and a piece of root ; there is also an unnumbered drawing which agrees with the first No. 34 but has, in addition, dissections of the hermaphrodite.
Pisonia 1041				
aculeata	**2,**217 ;	312 ;	**481.**	
Pistia 1768				
Stratiotes ...	**3,**131 ;	502 ;	**1270 ;**	Pl. Corom. 268.
Pisum 2020				
sativum	**3,**321 ;	566 ;	— ;	no drawing.
Pittosporum 882				
Tobira	**1,**631 ;	212 ;	— ;	no drawing.
Pladera 443				
decussata ..	**1,**402 ;	135 ;	**236.**	
perfoliata ...	**1,**402 ;	135 ;	**1227.**	
pusilla	**1,**403 ;	135 ;	**538.**	
sessiliflora ...	**1,**400 ;	134 ;	**1786.**	
virgata	**1,**401 ;	134 ;	**235.**	
Plantago 447				
Ispaghula ...	**1,**404 ;	135 ;	**1943.**	

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Plectranthus 1616				
aromaticus ...	**3**,322 ;	466 ;	**958.**	
monodelphus ...	**3**,322 ;	465 ;	**1459.**	
scutellarioides ...	**3**,321 ;	465 ;	**1254 ;**	drawing is named *Ocymum scutellarioides.*
secundus ...	**3**,320 ;	465 ;	**1458.**	
strobiliferus ...	**3**,323 ;	466 ;	**308.**	
Plumbago 533				
rosea	**1**,463 ;	155 ;	**555.**	
zeylanica ...	**1**,463 ;	155 ;	**554.**	
Plumeria 650				
acuminata ...	**2**,20 ;	248 ;	**1037 ;**	Wight Ic. 471.
Poa 373				
bifaria	**1**,331 ;	111 ;	**827 ;**	also an unnumbered drawing, identical with No. 827 but more extensive, and like it named *Poa secunda*—it is annotated " Ic. Roxburgh " by J. D. Hooker.
chinensis ...	**1**,332 ;	111 ;	**828.**	
ciliaris	**1**,334 ;	112 ;	**832.**	
ciliata	**1**,334 ;	112 ;	**831.**	
cylindrica ...	**1**,334 ;	112 ;	— ;	no drawing.
cynosuroides ...	**1**,333 ;	112 ;	**830.**	
diandra	**1**,336 ;	112 ;	**1330.**	
elegans	**1**,338 ;	113 ;	**841.**	
flexuosa ...	**1**,339 ;	114 ;	**843.**	
gangetica ...	**1**,340 ;	114 ;	**2111.**	
interrupta ...	**1**,335 ;	112 ;	**833** & **834.**	
multiflora ...	**1**,338 ;	114 ;	**840.**	
nutans	**1**,335 ;	112 ;	**835.**	
paniculata ...	**1**,340 ;	114 ;	**844.**	
plumosa	**1**,337 ;	113 ;	**838 ;**	also an unnumbered drawing with a general resemblance to No. 838, on which is written " unknown to Dr. R. but is no doubt a *Poa* " in what seems to be Roxburgh's hand.
procera	**1**,332 ;	112 ;	**829.**	
punctata ...	**1**,338 ;	113 ;	**839.**	
tenella	**1**,337 ;	113 ;	**837.**	
unioloides ...	**1**,339 ;	114 ;	**842.**	
viscosa	**1**,336 ;	113 ;	**836.**	
Podalyria 1154				
bracteata ...	**2**,317 ;	343 ;	**2237 ;**	Pl. Corom. 259 ; Wight Ic. 265.
Poinciana 1201				
elata	**2**,355 ;	356 ;	**2489 ;**	No. 2486 on drawing.
pulcherrima ...	**2**,355 ;	356 ;	— ;	no drawing.
Polyanthes 987				
tuberosa ...	**2**,166 ;	295 ;	— ;	no drawing.
Polygala 1879				
arvensis	**3**,218 ;	531 ;	**675.**	
telephioides ...	**3**,218 ;	531 ;	**676.**	
undulata ...	**3**,219 ;	531 ;	**2534.**	
Polygonum 1115				
barbatum ...	**2**,289 ;	335 ;	**631.**	
chinense ...	**2**,289 ;	334 ;	— ;	no drawing.

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Polygonum—*continued*				
cymosum	**2,289** ;	334 ;	— ;	no drawing.
elegans	**2,291** ;	335 ;	**632.**	
fagopyrum ...	**2,292** ;	335 ;	— ;	no drawing.
flaccidum ...	**2,291** ;	335 ;	**1056.**	
glabrum ...	**2,287** ;	334 ;	**629.**	
horridum ...	**2,291** ;	335 ;	— ;	no drawing.
lanatum	**2,285** ;	333 ;	**939.**	
nutans	**2,285** ;	333 ;	**1135.**	
perfoliatum ...	**2,288** ;	334 ;	**1412.**	
pilosum	**2,286** ;	333 ;	**938.**	
rivulare	**2,290** ;	335 ;	**630.**	
tenellum ...	**2,289** ;	334 ;	**1134.**	
tomentosum ...	**2,287** ;	334 ;	**628.**	
Polypodium				
acuminatum ...	— ;	752 ;	— ;	no drawing.
acutum	— ;	753 ;	— ;	no drawing.
aemulum ...	— ;	754 ;	— ;	no drawing.
affine	— ;	754 ;	— ;	no drawing.
arborescens ...	— ;	754 ;	— ;	no drawing.
arboreum ...	— ;	754 ;	— ;	no drawing.
attenuatum ...	— ;	749 ;	— ;	no drawing.
ciliatum	— ;	761 ;	— ;	no drawing.
confertum ...	— ;	754 ;	— ;	no drawing.
confluens ...	— ;	754 ;	— ;	no drawing.
coriaceum ...	— ;	749 ;	**1744.**	
cuspidatum ...	— ;	753 ;	— ;	no drawing.
dichotomum ...	— ;	753 ;	— ;	no drawing.
dubium	— ;	754 ;	— ;	no drawing.
elatum	— ;	754 ;	— ;	no drawing.
excavatum ...	— ;	751 ;	**1747.**	
felinum	— ;	754 ;	— ;	no drawing.
ferrugineum ...	— ;	751 ;	— ;	no drawing.
flagelliferum ...	— ;	751 ;	**1748.**	
furcatum ...	— ;	753 ;	— ;	no drawing.
glabrum ...	— ;	750 ;	**1006.**	
impuberum ...	— ;	754 ;	— ;	no drawing.
involucratum ...	— ;	753 ;	— ;	no drawing.
longifolium ...	— ;	753 ;	— ;	no drawing.
lucidum	— ;	751 ;	**1922.**	
mucronatum ...	— ;	752 ;	— ;	no drawing.
multiflorum ...	— ;	753 ;	— ;	no drawing.
nudatum ...	— ;	753 ;	— ;	no drawing.
parasiticum ...	— ;	753 ;	— ;	no drawing.
pertusum ...	— ;	750 ;	**1745.**	
phyllitidis ...	— ;	750 ;	— ;	no drawing.
phymatodes ...	— ;	750 ;	— ;	no drawing.
pilosum	— ;	753 ;	— ;	no drawing.
proliferum ...	— ;	752 ;	**1007.**	
quercifolium ...	— ;	750 ;	**1100.**	
radicans	— ;	752 ;	— ;	no drawing.
rupestre ...	— ;	752 ;	— ;	no drawing.
scabrum ...	— ;	753 ;	— ;	no drawing.
scariosum ...	— ;	754 ;	— ;	no drawing.
semi-pinnatum ...	— ;	751 ;	— ;	no drawing.
semi-sagittatum ...	— ;	753 ;	— ;	no drawing.
sophoroides ...	— ;	752 ;	— ;	no drawing.
squarrosum ...	— ;	754 ;	— ;	no drawing.
tenerum	— ;	752 ;	— ;	no drawing.
tomentosum ...	— ;	750 ;	**1746.**	
tridentatum ...	— ;	754 ;	— ;	no drawing.
unitum ...	— ;	752 ;	**1749.**	

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Pommereulla 372				
Cornucopiae ...	1,331 ;	111 ;	**771 ;**	Pl. Corom. 131.
Pontederia 936				
dilatata	2,123 ;	282 ;	— ;	no drawing.
hastata	2,121 ;	281 ;	**598.**	
plantaginea ...	2,123 ;	281 ;	— ;	no drawing.
sagittata ...	2,124 ;	282 ;	— ;	no drawing.
vaginalis ...	2,121 ;	281 ;	**597.**	
Porana 554				
paniculata ...	1,464 ;	156 ;	**1352 ;**	drawing missing ; Pl. Corom. 235 ; there is an unnumbered drawing which agrees with t. 235 in some respects but differs in being much less floriferus.
racemosa ...	1,466 ;	156 ;	**1531.**	
volubilis	1,465 ;	156 ;	**1530.**	
Portulaca 1327				
meridiana ...	2,463 ;	391 ;	**652 ;**	also an unnumbered drawing with dissections like those of No. 652, but with main figure quite different.
oleracea	2,463 ;	391 ;	— ;	no drawing.
quadrifida ...	2,464 ;	391 ;	**653.**	
tuberosa ...	2,464 ;	391 ;	**2496 ;**	No. 2493 on drawing.
Posoqueria 764				
dumetorum ...	1,713 ;	239 ;	**10 ;**	drawing originally as *Gardenia dumetorum*, as was the description in the Kew MS.
fasciculata ...	1,718 ;	241 ;	**2456 ;**	No. 2457 on drawing.
floribunda ...	1,719 ;	241 ;	**2198 ;**	Wight Ic. 583.
fragrans ...	1,717 ;	241 ;	**13 ;**	Pl. Corom. 137 as *Gardenia fragrans* which was the original name on the drawing and in the Kew MS.
longiflora ...	1,718 ;	241 ;	**2457 ;**	No. 2458 on drawing.
longispina ...	1,716 ;	240 ;	**1379 ;**	Wight Ic. 582 as *Gardenia longispina* which was the original name on the drawing and in the Kew MS. where Roxburgh has changed it to *Posoqueria longispina*.
nutans	1,714 ;	240 ;	**2199 ;**	Wight Ic. 581.
uliginosa ...	1,712 ;	239 ;	**12 ;**	originally as *Gardenia uliginosa*.
Potamogeton 499				
indicum	1,452 ;	152 ;	**2036.**	
tuberosum ...	1,453 ;	152 ;	**2432 ;**	No. 2433 on drawing.
Pothos 477				
caudata ...	1,436 ;	146 ;	— ;	no drawing.
decursiva ...	1,436 ;	146 ;	**2118 ;**	Wight Ic. 779.
gigantea ...	1,434 ;	145 ;	**2117.**	
gracilis	1,433 ;	145 ;	— ;	no drawing.
heterophylla ...	1,437 ;	147 ;	**2119 ;**	Wight Ic. 777.
Lasia	1,438 ;	147 ;	**253.**	
officinalis ...	1,431 ;	145 ;	**2115 ;**	Wight Ic. 778.
Peepla	1,433 ;	145 ;	**2116 ;**	Wight Ic. 780.
pertusa ...	1,435 ;	146 ;	**983 ;**	Wight Ic. 781.
pinnata	1,435 ;	146 ;	**2431.**	
pinnatifida ...	1,437 ;	146 ;	— ;	no drawing.
scandens ...	1,430 ;	144 ;	**2114 ;**	Wight Ic. 776.

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Prasium 1625				
melissifolium ...	3,326 ;	467 ;	**2527 ;**	No. 2521 on drawing.
Premna 1691				
cordifolia ...	3,78 ;	484 ;	**1462.**	
esculenta ...	3,81 ;	485 ;	**2304.**	
herbacea... ...	3,80 ;	485 ;	**1461.**	
integrifolia ...	3,81 ;	485 ;	— ;	no drawing.
latifolia	3,76 ;	483 ;	**54.**	
longifolia ...	3,79 ;	484 ;	**1575.**	
mucronata ...	3,80 ;	485 ;	— ;	no drawing.
scandens ...	3,82 ;	485 ;	**2305.**	
serratifolia ...	3,77 ;	484 ;	**1878.**	
spinosa	3,77 ;	484 ;	**961.**	
tomentosa ...	3,76 ;	483 ;	**55.**	
Prenanthes 2114				
acaulis	3,403 ;	593 ;	**1632.**	
asplenifolia ...	3,404 ;	594 ;	**1281.**	
procumbens ...	3,404 ;	593 ;	**1992.**	
racemosa ...	3,405 ;	594 ;	**418.**	
Prosopis				
spicigera ...	2,371 ;	361 ;	**49 ;**	Pl. Corom. 63 ; as *Adenanthera aculeata* in Flora Indica.
Prunus 1370				
armeniaca ...	2,501 ;	403 ;	— ;	no drawing.
cerasus	2,501 ;	403 ;	— ;	no drawing.
silvatica ...	2,501 ;	403 ;	**2265.**	
trifolia	2,501 ;	403 ;	**2264 ;**	*Prunus triflora* in Kew MS.
Psathura 780				
borbonica ...	1,532 ;	178 ;	— ;	no drawing.
Psidium 1346				
pomiferum ...	2,480 ;	396 ;	— ;	no drawing.
pyriferum ...	2,480 ;	396 ;	— ;	no drawing.
Psoralea 2096				
corylifolia ...	3,387 ;	588 ;	**410.**	
obovata ...	3,388 ;	588 ;	— ;	no drawing.
Psychotria 780				
asiatica	1,533 ;	179 ;	— ;	no drawing.
herbacea ...	1,533 ;	179 ;	— ;	no drawing.
Pteris				
amplexicaulis ...	— ;	758 ;	**1005.**	
angustifolia ...	— ;	757 ;	**1751.**	
bicolor	— ;	758 ;	— ;	no drawing.
daucifolia ...	— ;	759 ;	— ;	no drawing.
dimidiata ...	— ;	758 ;	— ;	no drawing.
gracilis	— ;	759 ;	— ;	no drawing.
graminifolia ...	— ;	757 ;	**2577 ;**	No. 2567 on drawing.
linearis	— ;	758 ;	— ;	no drawing.
lobata	— ;	757 ;	— ;	no drawing.
lunulata	— ;	758 ;	— ;	no drawing.
multifida ...	— ;	758 ;	— ;	no drawing.
pectinata ...	— ;	759 ;	— ;	no drawing.
pedatifida ...	— ;	759 ;	— ;	no drawing.
piloselloides ...	— ;	757 ;	**2576 ;**	No. 2566 on drawing.
quadri-aurita ...	— ;	759 ;	— ;	no drawing.

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Pteris—*continued*				
scandens ...	— ;	758 ;	**1752.**	
succulenta ...	— ;	759 ;	**1754.**	
tripinnatifida ...	— ;	759 ;	— ;	no drawing.
vittata	— ;	757 ;	**1753 ;**	also an unnumbered drawing virtually identical with No. 1753.
[Pternandra coerulescens]	**2**,225 ;	314 ;	**1133 ;**	in Flora Indica as " New Genus ".
Pterocarpus 1899				
dalbergioides ...	**3**,236 ;	537 ;	**1587.**	
indicus	**3**,236 ;	538 ;	**1885.**	
marsupium ...	**3**,234 ;	536 ;	**80 ;**	Pl. Corom. 116.
santalinus ...	**3**,234 ;	536 ;	— ;	no drawing.
Pterospermum 1804				
acerifolium ...	**3**,158 ;	511 ;	**968 ;**	Wight Ic. 631.
canescens ...	**3**,162 ;	512 ;	**1989.**	
lanceaefolium ...	**3**,163 ;	513 ;	**2079.**	
paniculatum ...	**2**,642 ;	448 ;	**1482 ;**	drawing missing ; according to Roxburgh in Flora Indica **2**,642 the drawing and description of this belong to *Humea elata* except for the fruit.
semi-sagittatum ...	**3**,160 ;	512 ;	**1880.**	
suberifolium ...	**3**,160 ;	512 ;	**967.**	
Pterygodium 2171				
sulcata ...	**3**,452 ;	610 ;	**1086 ;**	*Ophrys sulcata* R. in the Kew MS.
Punica 1368				
granatum ...	**2**,499 ;	402 ;	— ;	no drawing.
Pyrethrum 2151				
Indicum ...	**3**,436 ;	604 ;	**2090.**	
Pyrostria 431				
hexasperma ...	**1**,388 ;	130 ;	— ;	no drawing.
Pyrus 1381				
chinensis ...	**2**,511 ;	406 ;	**1443.**	
communis ...	**2**,510 ;	406 ;	— ;	no drawing.
cydonia	**2**,511 ;	406 ;	— ;	no drawing.
indica	**2**,511 ;	406 ;	— ;	no drawing.
Malus	**2**,511 ;	406 ;	— ;	no drawing.
tomentosa ...	**2**,512 ;	407 ;	— ;	no drawing.
Quercus 2374				
acuminata ...	**3**,636 ;	672 ;	**2386.**	
armata	**3**,640 ;	673 ;	**2390 ;**	Pl. Corom. 296 ; Wight Ic. 770.
castanicarpa ...	**3**,640 ;	673 ;	**2391 ;**	Pl. Corom. 296 ; Wight Ic. 769.
depressa	**3**,640 ;	673 ;	**2555 ;**	No. 2548 on drawing.
fenestrata ...	**3**,633 ;	671 ;	**2383 ;**	Wight Ic. 219.
ferox	**3**,639 ;	673 ;	**2389 ;**	Wight Ic. 218.
glomerata ...	**3**,640 ;	673 ;	— ;	no drawing.
incana	**3**,642 ;	674 ;	**1680 ;**	also an unnumbered drawing which is identical with No. 1680 except that it has a little more stem—it bears the name Quercus Gottii Roxb. in ink, but the epithet is crossed through and replaced by " incana R. " in pencil in Roxburgh's autograph.

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Quercus—*continued*				
lamellata ...	**3**,641 ;	673 ;	**2556 ;**	No. 2549 on drawing.
lanceaefolia ...	**3**,634 ;	671 ;	**2384 ;**	Wight Ic. 212.
lappacea ...	**3**,637 ;	672 ;	**2387 ;**	Wight Ic. 220.
lucida	**3**,635 ;	672 ;	**1178 ;**	also an unnumbered drawing, a replica of No. 1178.
muricata... ...	**3**,635 ;	672 ;	**2554 ;**	No. 2547 on drawing.
semi-serrata ...	**3**,641 ;	673 ;	**2392 ;**	Wight Ic. 211.
serrata	**3**,641 ;	674 ;	**2393.**	
squamata ...	**3**,638 ;	673 ;	**2388 ;**	Wight Ic. 213.
turbinata ...	**3**,636 ;	672 ;	**2385 ;**	Wight Ic. 221.
Quisqualis 1287				
indica	**2**,427 ;	379 ;	**2133.**	
villosa	**2**,426 ;	379 ;	**2132.**	
Randia 736				
polysperma ...	**1**,527 ;	177 ;	— ;	no drawing.
racemosa ...	**1**,525 ;	176 ;	**1207 ;**	*Ixora polysperma* on drawing.
stricta	**1**,526 ;	177 ;	**1029.**	
Ranunculus 1586				
indicus	**2**,672 ;	458 ;	**1072.**	
Raphanus 1760				
sativus	**3**,126 ;	500 ;	— ;	no drawing.
Rhamnus 882				
circumscissus ...	**1**,604 ;	203 ;	**1539.**	
incanus	**1**,603 ;	203 ;	**1371.**	
lucidus	**1**,605 ;	203 ;	— ;	no drawing.
virgatus ...	**1**,604 ;	203 ;	**2448.**	
Rhizophora 1321				
decandra ...	— ;	— ;	**1140 ;**	in Roxb. Hort. Beng. 36, but seemingly omitted from Flora Indica.
gymnorrhiza ...	**2**,460 ;	390 ;	**1246.**	
mangle ...	**2**,459 ;	389 ;	**1849.**	
parviflora ...	**2**,461 ;	390 ;	**2497 ;**	No. 2494 on drawing.
Rhododendron 1268				
puniceum ...	**2**,409 ;	373 ;	**2059.**	
Rhopala 404				
excelsa	**1**,362 ;	121 ;	**2427 ;**	Wight Ic. 190.
moluccana ...	**1**,361 ;	121 ;	**1119.**	
robusta	**1**,363 ;	122 ;	**2426 ;**	Wight Ic. 191.
serrata	**1**,362 ;	121 ;	**1782 ;**	no drawing.
Rhus 849				
Bucki-amela ...	**2**,99 ;	273 ;	**1228 ;**	Wight Ic. 561.
parviflorum ...	**2**,100 ;	274 ;	**2469 ;**	No. 2467 on drawing.
succedaneum ...	**2**,98 ;	273 ;	**1546 ;**	Wight Ic. 560.
Ricinus 2438				
communis ...	**3**,689 ;	690 ;	— ;	no drawing.
dicoccus	**3**,690 ;	690 ;	**1914.**	
Mappa ...	**3**,690 ;	690 ;	**1689 ;**	Wight Ic. 816.
Rivinia				
laevis	— ;	— ;	**1211 ;**	an American species cultivated at Calcutta, not included in Flora Indica.

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Robergia 1317				
hirsuta	**2,**455 ;	388 ;	— ;	no drawing.
Robinia 2026				
candida ...	**3,**327 ;	568 ;	**1274.**	
dubia	— ;	— ;	**2543 ;**	in the Kew MS. No. 2543 has a pencil note " Robinia dubia no description " ; No. 2537 on drawing.
ferruginea ...	**3,**329 ;	569 ;	**2541 ;**	No. 2535 on drawing.
fruticosa ...	**3,**328 ;	568 ;	**1891.**	
macrophylla ...	**3,**329 ;	568 ;	**2329.**	
paniculata ...	— ;	— ;	**2540 ;**	No. 2534 on drawing ; apparently omitted from Flora Indica.
racemosa ...	**3,**329 ;	569 ;	**300.**	
sennoides ...	**3,**328 ;	568 ;	**976**	(no drawing) & **2542** (No. 2536 on drawing) ; the description under No. 976 in the Kew MS. is not in the Flora Indica.
suberosa ...	**3,**327 ;	568 ;	**1275.**	
Rondeletia 748				
exserta	**1,**523 ;	176 ;	**1363.**	
paniculata ...	**1,**521 ;	176 ;	**1954.**	
scandens ...	**1,**524 ;	176 ;	— ;	no drawing.
tetrandra ...	**1,**524 ;	176 ;	**1115.**	
tinctoria ...	**1,**522 ;	175 ;	**1955.**	
Rosa 1384				
centifolia ...	**2,**513 ;	407 ;	— ;	no drawing.
chinensis ...	**2,**513 ;	407 ;	**1145.**	
diffusa	**2,**515 ;	408 ;	— ;	no drawing.
glandulifera ...	**2,**514 ;	407 ;	**1980.**	
inermis ...	**2,**516 ;	408 ;	— ;	no drawing.
involucrata ...	**2,**513 ;	407 ;	**1249.**	
microphylla ...	**2,**515 ;	408 ;	— ;	no drawing.
pubescens ...	**2,**514 ;	407 ;	**1981.**	
recurva	**2,**515 ;	407 ;	— ;	no drawing.
semperflorens ...	**2,**514 ;	407 ;	— ;	no drawing.
triphylla ...	**2,**515 ;	408 ;	— ;	no drawing.
Roscoea 1661				
pentandra ...	**3,**54 ;	476 ;	**2296.**	
tomentosa ...	**3,**56 ;	477 ;	**2298 ;**	Pl. Corom. 293 as *Congea tomentosa.*
villosa	**3,**55 ;	476 ;	**2297.**	
Rottboellia 396				
biflora	**1,**358 ;	120 ;	**2112.**	
compressa ...	**1,**354 ;	119 ;	**859 ;**	Pl. Corom. 156.
corymbosa ...	**1,**355 ;	119 ;	**861 ;**	Pl. Corom. 181.
exaltata ...	**1,**354 ;	119 ;	**860 ;**	Pl. Corom. 157.
glabra	**1,**353 ;	118 ;	**1332.**	
perforata ...	**1,**356 ;	119 ;	**862 ;**	Pl. Corom. 182.
setacea	**1,**357 ;	120 ;	**865 ;**	Pl. Corom. 132.
Thomaea ...	**1,**357 ;	120 ;	**866 ;**	Pl. Corom. 132.
Rottlera 2604				
alba	**3,**829 ;	737 ;	**1712.**	
dicocca	**3,**829 ;	737 ;	**480.**	
ferruginea ...	**3,**828 ;	737 ;	— ;	no drawing.
hexandria ...	**3,**829 ;	738 ;	— ;	no drawing.
peltata	**3,**828 ;	737 ;	**2407.**	
tetracocca ...	**3,**826 ;	737 ;	**2408.**	
tinctoria ...	**3,**827 ;	737 ;	**106 ;**	Pl. Corom. 168.

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Roxburghia 1059				
gloriosoides ...	**2**,234 ;	317 ;	**208 ;**	Pl. Corom. 32 ; Wight Ic. 2061 ; also an unnumbered drawing quite different from No. 208, it bears a pencil note, " bad, very bad " in Roxburgh's autograph.
Roydsia 1558				
suaveolens ...	**2**,643 ;	449 ;	**2287 ;**	Pl. Corom. 289 ; the drawing has been severely trimmed and the name and number lost, but it is undoubtedly the original of Pl. Corom. t. 289.
Rubia 418				
Munjista ...	**1**,374 ;	125 ;	**1023 ;**	Wight Ic. 187 ; in Flora Indica **2**,541, this species is mentioned under the name *Rubia munjeet.*
Rubus 1387				
albescens ...	**2**,519 ;	409 ;	**1856.**	
gowreephul ...	**2**,517 ;	408 ;	**1854.**	
gracilis	**2**,520 ;	409 ;	**1855.**	
hexagynus ...	**2**,516 ;	408 ;	**2267.**	
hirtus	**2**,518 ;	409 ;	**2268.**	
moluccanus ...	**2**,518 ;	408 ;	**1853.**	
paniculatus ...	**2**,518 ;	409 ;	**1444.**	
racemosus ...	**2**,519 ;	409 ;	— ;	no drawing.
rosaeflorus ...	**2**,519 ;	409 ;	— ;	no drawing.
rosaefolius ...	**2**,518 ;	409 ;	— ;	no drawing.
Ruellia 1644				
bracteata ...	**3**,47 ;	474 ;	**330.**	
cernua	**3**,45 ;	473 ;	**1469.**	
comosa ...	**3**,43 ;	472 ;	**1871.**	
dependens ...	**3**,49 ;	474 ;	**1468.**	
fasciculata ...	**3**,48 ;	474 ;	**326.**	
flagelliformis ...	**3**,47 ;	474 ;	— ;	no drawing.
flava	**3**,43 ;	473 ;	**2077.**	
hirsuta	**3**,51 ;	475 ;	— ;	no drawing.
hirta	**3**,46 ;	473 ;	**324.**	
imbricata ...	**3**,49 ;	474 ;	**1470.**	
infundibuliformis ...	**3**,41 ;	472 ;	**97.**	
latebrosa ...	**3**,46 ;	474 ;	**325 ;**	also an unnumbered drawing, quite different from No. 325, which is annotated " Ic. Roxb. " in pencil.
longifolia ...	**3**,50 ;	475 ;	**1264.**	
obovata ...	**3**,51 ;	475 ;	**2528 ;**	No. 2522 on drawing.
patula	**3**,45 ;	473 ;	**323.**	
pavala	**3**,47 ;	474 ;	**327.**	
racemosa ...	**3**,42 ;	472 ;	— ;	no drawing.
ringens	**3**,44 ;	473 ;	**1262.**	
salicifolia ...	**3**,50 ;	475 ;	**328.**	
suffruticosa ...	**3**,53 ;	476 ;	**2529.**	
triflora	**3**,52 ;	475 ;	**1150.**	
uliginosa ...	**3**,52 ;	475 ;	**329.**	
zeylanica ...	**3**,42 ;	472 ;	**1987.**	
Rumex 1030				
acutus	**2**,208 ;	309 ;	**1052.**	
vesicarius ...	**2**,209 ;	309 ;	— ;	no drawing.
Ruta 1226				
graveolens ...	**2**,374 ;	362 ;	— ;	no drawing.

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Saccharum 258.				
canaliculatum ...	1,246 ;	82 ;	— ;	no drawing.
cylindricum ...	1,234 ;	78 ;	**775 ;**	also an unnumbered drawing identical with No. 775 but having an extra shoot ; both drawings bear the name *Saccharum diandrum* in Roxburgh's autograph.
exaltatum ...	1,245 ;	82 ;	**774.**	
fuscum	1,236 ;	79 ;	**1114.**	
Munja	1,246 ;	82 ;	**1522.**	
officinarum ...	1,237 ;	79 ;	**773.**	
procerum ...	1,243 ;	81 ;	**1324.**	
Sara	1,244 ;	82 ;	**1113.**	
semi-decumbens ...	1,236 ;	79 ;	**1323.**	
sinensis	1,239 ;	80 ;	**1322 ;**	Pl. Corom. 232.
spontaneum ...	2,235 ;	79 ;	**772.**	
Sagittaria 2386				
cordifolia ...	3,647 ;	675 ;	**987.**	
obtusifolia ...	3,646 ;	675 ;	**450.**	
sagittifolia ...	3,645 ;	675 ;	**1996.**	
Saguerus 2366				
Rumphii ...	3,626 ;	669 ;	**1179.**	
Sagus 2364				
inermis ...	3,623 ;	668 ;	— ;	no drawing.
Rumphii ...	3,623 ;	668 ;	— ;	no drawing.
Salicornia 91				
brachiata ...	1,84 ;	28 ;	**505 ;**	Wight Ic. 738.
indica	1,85 ;	29 ;	**506 ;**	Wight Ic. 737.
Salix 2513				
Babylonica ...	3,754 ;	712 ;	— ;	no drawing.
tetrasperma ...	3,753 ;	712 ;	**476 ;**	Pl. Corom. 97.
Salsola 513				
indica	2,62 ;	261 ;	**589.**	
nudiflora ...	2,60 ;	261 ;	**588.**	
Salvadora 432				
persica	1,389 ;	130 ;	**72 ;**	Pl. Corom. 26.
Salvia 159				
bengalensis ...	1,145 ;	49 ;	**530.**	
brachiata ...	1,145 ;	49 ;	**531.**	
coccinea ...	1,146 ;	49 ;	**1106.**	
lanata	1,146 ;	49 ;	— ;	no drawing.
Salvinia				
cucullata ...	— ;	745 ;	— ;	no drawing.
imbricata ...	— ;	745 ;	— ;	no drawing.
verticillata ...	— ;	745 ;	— ;	no drawing.
Samara 459				
paniculata ...	1,414 ;	139 ;	**170.**	
polygama ...	1,414 ;	139 ;	— ;	no drawing.
Sambucus 818				
Ebulus	2,100 ;	274 ;	— ;	no drawing.
Sandoricum 1249				
indicum	2,392 ;	368 ;	**1063 ;**	Pl. Corom. 261.

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Sanseviera 981				
zeylanica ...	2,161 ;	294 ;	**600 ;**	Pl. Corom. 184.
Santalum 488				
album	1,442 ;	148 ;	**1944.**	
myrtifolium ...	1,444 ;	148 ;	**177 ;**	Pl. Corom. 2 as *Sirium myrtifolium* though the drawing is inscribed *Santalum myrtifolium* ; also an unnumbered drawing only slightly different from No. 177 and bearing the name *Santalum myrtifolium* R. in pencil in Roxburgh's autograph.
Sapindus 1108				
detergens ...	2,280 ;	332 ;	**1057.**	
emarginatus ...	2,279 ;	332 ;	**1235.**	
fruticosus ...	2,283 ;	333 ;	**1407 ;**	drawing is named " Allophyllus pinnatus R."
laurifolius ...	2,278 ;	331 ;	**1965 ;**	drawing named *Sapindus acutus*.
longifolius ...	2,282 ;	332 ;	— ;	no drawing.
rubiginosus ...	2,282 ;	332 ;	**89 ;**	Pl. Corom. 62.
serratus	2,284 ;	333 ;	— ;	no drawing.
squamosus ...	2,282 ;	332 ;	— ;	no drawing.
Sapium 2441				
baccatum ...	3,694 ;	691 ;	**2397.**	
cordifolium ...	3,694 ;	691 ;	**233.**	
Indicum ...	3,692 ;	691 ;	**1296 ;**	drawing named *Sapium bengirium*.
sebiferum ...	3,693 ;	691 ;	**989.**	
Saponaria 1307				
perfoliata ...	2,446 ;	385 ;	**1242.**	
Scaevola 729				
oppositifolia ...	1,528 ;	177 ;	— ;	no drawing.
Taccada ...	1,527 ;	177 ;	**1797.**	
Schleichera 1105				
pentapetala ...	2,275 ;	330 ;	**2231 ;**	Wight Ic. 402.
trijuga	2,277 ;	331 ;	**680.**	
Schoenus 200				
articulatus ...	1,184 ;	62 ;	**703.**	
Schrebera 117				
swietenioides ...	1,109 ;	37 ;	**7 ;**	Pl. Corom. 101.
Scilla 966				
coromandeliana ...	2,147 ;	289 ;	**1821.**	
indica	2,147 ;	289 ;	**1396.**	
Scirpus 230				
acutangulus ...	1,213 ;	71 ;	**737.**	
aestivalis ...	1,227 ;	76 ;	— ;	no drawing.
anceps	1,230 ;	77 ;	— ;	no drawing.
antarcticus ...	1,223 ;	75 ;	**753 ;**	also an unnumbered drawing different from No. 753.
argenteus ...	1,223 ;	75 ;	**754 ;**	also an unnumbered drawing different from No. 754.
articulatus ...	1,214 ;	72 ;	**739.**	
arvensis	1,224 ;	75 ;	**2422.**	
atropurpureus ...	1,219 ;	73 ;	**2419.**	
bispicatus ...	1,220 ;	74 ;	**749 ;**	also an unnumbered drawing different from No. 749.

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Scirpus—*continued*				
brevifolius ...	1,226 ;	76 ;	**757 ;**	also an unnumbered drawing different from No. 757.
capitatus ...	1,215 ;	72 ;	**741 ;**	also an unnumbered drawing different from No. 741.
complanatus ...	1,228 ;	76 ;	**760.**	
diphyllus ...	1,227 ;	76 ;	**758.**	
dubius	1,215 ;	72 ;	**698 ;**	Roxburgh originally had this as *Isoetes tuberosa* Roxb., but in the Kew MS. he has altered his account of the plant and renamed it *Scirpus dubius*.
globulosus ...	1,217 ;	73 ;	**745.**	
glomeratus ...	1,224 ;	75 ;	**2421.**	
grossus	1,231 ;	77 ;	**764.**	
incurvatus ...	1,214 ;	72 ;	**1932.**	
juncoides ...	1,216 ;	72 ;	**742.**	
Kysoor	1,230 ;	77 ;	**2017.**	
maximus ...	1,231 ;	77 ;	**765.**	
medius	1,213 ;	72 ;	**738 ;**	as *Scirpus spiraloides* Roxb. in the Kew MS.
miliaceus ...	1,227 ;	76 ;	**759.**	
minimus ...	1,219 ;	73 ;	**2420.**	
monander ...	1,222 ;	74 ;	**752 ;**	also an unnumbered drawing different from No. 752 but, like it, originally named *Scirpus pumilus*.
monostachyus ...	1,219 ;	73 ;	**747 ;**	also an unnumbered drawing quite different from No. 747.
mucronatus ...	1,216 ;	72 ;	**743.**	
pallescens ...	1,229 ;	77 ;	**763.**	
pectinatus ...	1,218 ;	73 ;	**744.**	
pentagonus ...	1,218 ;	73 ;	**746.**	
plantaginus ...	1,212 ;	71 ;	**734.**	
quinquangularis ...	1,229 ;	77 ;	**762.**	
scaber	1,220 ;	74 ;	**748 ;**	also an unnumbered drawing different from No. 748.
schoenoides ...	1,221 ;	74 ;	**750 ;**	also an unnumbered drawing different from No. 750.
spiralis	1,212 ;	71 ;	**736.**	
squarrosus ...	1,222 ;	74 ;	**751 ;**	also an unnumbered drawing different from No. 751.
strictus	1,226 ;	76 ;	**756.**	
strobilinus ...	1,219 ;	73 ;	**2173.**	
sub-articulatus ...	1,215 ;	72 ;	**740.**	
supinus	1,217 ;	73 ;	**1933.**	
tenellus	1,224 ;	75 ;	**2423.**	
tetragonus ...	1,228 ;	76 ;	**761.**	
triangulatus ...	1,217 ;	73 ;	— ;	no drawing.
tridentatus ...	1,225 ;	75 ;	**755.**	
tristachyus ...	1,221 ;	74 ;	**1931.**	
tuberosus ...	1,210 ;	70 ;	**1112.**	
tumidus ...	1,212 ;	71 ;	**735.**	
Scleria 2307				
biflora	3,573 ;	651 ;	**1294.**	
corymbosa ...	3,574 ;	651 ;	— ;	no drawing.
laevis	3,574 ;	651 ;	— ;	no drawing.
lithosperma ...	3,574 ;	651 ;	— ;	no drawing.
setigera	3,575 ;	651 ;	— ;	no drawing.
tenuis	3,574 ;	651 ;	— ;	no drawing.
Scolopendrium lanceolatum ...	— ;	756 ;	— ;	no drawing.

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Scopolia 846				
aculeata	**1**,616 ;	207 ;	**191.**	
Scutellaria 1621				
indica	**3**,24 ;	466 ;	**1258.**	
peregrina ...	**3**,24 ;	466 ;	— ;	no drawing.
Scytalia 1097				
Danura	**2**,274 ;	330 ;	**1136.**	
Lichi	**2**,269 ;	328 ;	**940** & **2485** ;	Wight Ic. 43 ; No. 2482 on drawing of No. 2485.
Longan	**2**,270 ;	329 ;	**941.**	
oppositifolia ...	**2**,273 ;	329 ;	— ;	no drawing.
parviflora ...	**2**,273 ;	329 ;	— ;	no drawing.
Ramboutan ...	**2**,271 ;	329 ;	— ;	no drawing.
rimosa	**2**,272 ;	329 ;	— ;	no drawing.
rubia	**2**,272 ;	329 ;	**2230** ;	*S. rubra* in Kew MS. ; Wight Ic. 24, 25.
verticillata ...	**2**,273 ;	329 ;	**1236** ;	drawing is named " Litchi verticillata ".
Sechium	— ;	— ;	**2560** ;	the name *Sechium* is in pencil in the Kew MS., and the description was not, apparently, included in Flora Indica, the drawing is numbered 2553 but this seems to be a mistaken reading of the faint pencil number.
Securidaca 1880				
paniculata ...	**3**,219 ;	531 ;	**2316.**	
Semecarpus 855				
Anacardium ...	**2**,83 ;	269 ;	**37** ;	Pl. Corom. 12 ; Wight Ic. 558.
Cassuvium ...	**2**,85 ;	269 ;	**1545** ;	Wight Ic. 559 ; drawing is named *Semecarpus angustifolium* Roxb.
cuneifolia ...	**2**,86 ;	269 ;	— ;	no drawing.
Senecio 2147				
Moluccana ...	**3**,433 ;	603 ;	— ;	no drawing.
Senna* 1182				
Absus	**2**,340 ;	351 ;	**636.**	
alata	**2**,349 ;	354 ;	**43.**	
arborescens ...	**2**,345 ;	352 ;	**1420.**	
aurata	**2**,342 ;	351 ;	— ;	no drawing.
auriculata ...	**2**,349 ;	354 ;	**638.**	
bicapsularis ...	**2**,342 ;	351 ;	— ;	no drawing.
dimidiata ...	**2**,352 ;	355 ;	**1839.**	
esculenta ...	**2**,346 ;	353 ;	**96.**	
exigua	**2**,339 ;	351 ;	— ;	no drawing.
glauca	**2**,351 ;	354 ;	**1838.**	
obtusa	**2**,344 ;	352 ;	**1418.**	
occidentalis ...	**2**,343 ;	352 ;	**1419** ;	drawing named *Cassia foetida.*
officinalis ...	**2**,346 ;	353 ;	— ;	no drawing.
prostrata ...	**2**,352 ;	355 ;	**639.**	
purpurea ...	**2**,342 ;	351 ;	**637.**	
sensitiva	**2**,353 ;	355 ;	**640.**	
sophora	**2**,347 ;	353 ;	**2488** ;	No. 2485 on drawing.
speciosa ...	**2**,347 ;	353 ;	**1061.**	
Sumatrana ...	**2**,347 ;	353 ;	**1421.**	

* Most of the species of this genus are under the generic name *Cassia* in the Kew MS., and the drawings are named the same.

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Senna—*continued*				
tenella	**2,**354 ;	355 ;	**1422.**	
Tora	**2,**340 ;	351 ;	— ;	no drawing.
toroides	**2,**341 ;	351 ;	**1417.**	
Serissa 810				
foetida	**1,**579 ;	195 ;	— ;	no drawing.
Serpicula 2313				
verticillata ...	**3,**578 ;	653 ;	**679 ;**	Pl. Corom. 164 ; at a later page (751) of Flora Indica this is transposed to *Vallisneria verticillata* and that name is on the verso of the drawing.
Serratula 2117				
anthelmintica ...	**3,**405 ;	594 ;	**419.**	
carthamoides ...	**3,**407 ;	594 ;	**1633.**	
cinerea	**3,**406 ;	594 ;	**1282.**	
Sesamum 1725				
indicum	**3,**101 ;	492 ;	**1149 ;**	no drawing.
orientale ...	**3,**100 ;	491 ;	**1148.**	
Seseli 914				
bengalensis ...	**2,**94 ;	272 ;	**1045 ;**	Wight Ic. 568.
Sesuvium 1380				
portulacastrum ...	**2,**509 ;	406 ;	**655.**	
Shorea 1529				
camphorifera ...	**2,**616 ;	440 ;	**2518 ;**	no drawing.
longisperma ...	**2,**618 ;	441 ;	— ;	no drawing.
robusta	**2,**615 ;	440 ;	**1070 ;**	drawing missing ; Pl. Corom. 212.
Talura	**2,**618 ;	441 ;	**1567** & **2073 ;**	the drawing of No. 1567 is inscribed " Saul jallaraea " and in the Kew MS. the name is *Shorea jallaroa* ; No. 2073 is under *Shorea jalura* as in the Kew MS. where reference is made to No. 1567.
Tumbagaia ...	**2,**617 ;	440 ;	**1566.**	
Sida 1817				
Abutilon ...	**3,**178 ;	518 ;	**2080.**	
acuta	**3,**171 ;	515 ;	**346.**	
alba	**3,**174 ;	516 ;	**344.**	
alnifolia ...	**3,**174 ;	516 ;	**343.**	
asiatica	**3,**179 ;	518 ;	**349/1.**	
chinensis ...	**3,**174 ;	516 ;	**342.**	
cordifolia ...	**3,**177 ;	517 ;	**348.**	
crispa	**3,**177 ;	517 ;	**1491.**	
cuneifolia ...	**3,**171 ;	515 ;	**341.**	
glutinosa ...	**3,**172 ;	516 ;	**347.**	
graveolens ...	**3,**179 ;	518 ;	**1492.**	
humilis ...	**3,**171 ;	516 ;	**345.**	
indica	**3,**179 ;	518 ;	**349/3.**	
lanceolata ...	**3,**175 ;	517 ;	**1487 ;**	also an unnumbered drawing more extensive than No. 1487 and differing in some respects but identical in others.
microphylla ...	**3,**170 ;	515 ;	**1485.**	
Napaca	**3,**175 ;	517 ;	**1486.**	
periplocifolia ...	**3,**172 ;	516 ;	— ;	no drawing.

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Sida—*continued*				
polyandria ...	**3,**173 ;	516 ;	**1881.**	
populifolia ...	**3,**179 ;	518 ;	**349/2.**	
retusa	**3,**175 ;	517 ;	**1488.**	
rhombifolia ...	**3,**176 ;	517 ;	**1490.**	
rhomboidea ...	**3,**176 ;	517 ;	**1489 ;**	no drawing ; there is an unnumbered drawing under this name.
tomentosa ...	**3,**178 ;	518 ;	**671.**	
Sideroxylon 716				
tomentosum ...	**1,**602 ;	202 ;	**117 ;**	Pl. Corom. 28.
Siegesbeckia 2154				
brachiata ...	**3,**439 ;	605 ;	**434.**	
orientalis ...	**3,**439 ;	605 ;	— ;	no drawing.
Silene 1309				
indica	**2,**446 ;	385 ;	**1555.**	
Sinapis 1749				
brassicata ...	**3,**120 ;	498 ;	**1477.**	
cuneifolia ...	**3,**121 ;	499 ;	**1579.**	
dichotoma ...	**3,**117 ;	497 ;	**1474.**	
divaricata ...	**3,**124 ;	499 ;	**1479.**	
erysimoides ...	**3,**123 ;	499 ;	**1879.**	
glauca	**3,**118 ;	498 ;	**1475.**	
patens	**3,**124 ;	500 ;	**1480.**	
pusilla	**3,**125 ;	500 ;	**1481.**	
ramosa	**3,**119 ;	498 ;	**1476.**	
rugosa	**3,**122 ;	499 ;	**1578.**	
trilocularis ...	**3,**121 ;	498 ;	**1478.**	
Siphonanthus 1668				
hastata	**3,**67 ;	481 ;	**2299.**	
indica	**3,**67 ;	481 ;	**963.**	
Sirium				
myrtifolium ...	**1,**444 ;	149 ;	**177 ;**	Pl. Corom. 2 ; in Flora Indica as *Santalum myrtifolium.*
Smilax 2556				
glabra	**3,**792 ;	725 ;	**2563 ;**	No. 2556 on drawing.
lanceaefolia ...	**3,**792 ;	725 ;	**2564 ;**	no drawing.
laurifolia ...	**3,**793 ;	725 ;	**2565 ;**	no drawing.
macrophylla ...	**3,**793 ;	725 ;	**2567 ;**	No. 2558 on drawing.
maculata ...	**3,**796 ;	726 ;	**1917 ;**	also an unnumbered drawing different from No. 1917.
ovalifolia ...	**3,**794 ;	726 ;	**997 ;**	Wight Ic. 809.
prolifera ...	**3,**795 ;	726 ;	**2566 ;**	No. 2557 on drawing.
pseudo-China ...	**3,**793 ;	725 ;	— ;	no drawing.
retusa	**3,**793 ;	725 ;	— ;	no drawing.
Smithia 2044				
aspera	**3,**343 ;	573 ;	**1892.**	
sensitiva	**3,**342 ;	573 ;	**1083.**	
Solanum 536				
aethiopicum ...	**1,**568 ;	191 ;	— ;	no drawing.
auriculatum ...	**1,**564 ;	189 ;	**1952.**	
decemdentatum ...	**1,**565 ;	190 ;	**1799.**	
diffusum ...	**1,**568 ;	191 ;	**575.**	
hirsutum ...	**1,**571 ;	192 ;	**920.**	
indicum	**1,**570 ;	191 ;	**1369.**	

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Solanum—*continued*				
insanum ...	**1,568** ;	191 ;	— ;	no drawing.
Jacquini ...	**1,569** ;	191 ;	**1368.**	
longum	**1,567** ;	190 ;	**574.**	
Lycopersicum ...	**1,565** ;	190 ;	— ;	no drawing.
Melongena ...	**1,566** ;	190 ;	— ;	no drawing.
pubescens ...	**1,564** ;	189 ;	**576.**	
rubrum	**1,565** ;	190 ;	— ;	no drawing.
spirale	**1,566** ;	190 ;	— ;	no drawing.
stramonifolium ...	**1,572** ;	192 ;	— ;	no drawing.
trilobatum ...	**1,571** ;	192 ;	**1800.**	
Sonchus 2113				
oleraceus ...	**3,403** ;	593 ;	**417.**	
orixensis ...	**3,402** ;	593 ;	**416.**	
Sonerila 192				
angustifolia ...	**1,178** ;	60 ;	**2172.**	
emaculata ...	**1,178** ;	60 ;	**2171.**	
maculata ...	**1,177** ;	59 ;	**2170.**	
moluccana ...	**1,178** ;	60 ;	— ;	no drawing.
Sonneratia 1376				
acida	**2,506** ;	405 ;	**947.**	
apetala ...	**2,506** ;	405 ;	**1144** ;	also an unnumbered drawing quite different from No. 1144 ; the name is *S. apetella* in Clarke's reprint, but this is a mistake.
Sophora 1153				
robusta	— ;	— ;	**2236** ;	Wight Ic. 245 ; apparently omitted from Flora Indica.
tomentosa ...	**2,316** ;	343 ;	**1416.**	
Spermacoce 409				
articularis ...	**1,372** ;	125 ;	**1525.**	
costata	**1,370** ;	124 ;	**1334.**	
exserta	**1,368** ;	123 ;	— ;	no drawing.
glabra	**1,368** ;	123 ;	**1116.**	
hispida	**1,373** ;	125 ;	**1526** ;	an unnumbered drawing under this name is very different from No. 1526.
laevis	**1,368** ;	124 ;	**2032** ;	Wight Ic. 193.
lineata	**1,369** ;	124 ;	— ;	no drawing.
nana	**1,370** ;	124 ;	— ;	no drawing.
scabra	**1,371** ;	125 ;	**1524.**	
semi-erecta ...	**1,371** ;	124 ;	**1333.**	
stricta	**1,370** ;	124 ;	**537.**	
sumatrensis ...	**1,366** ;	123 ;	**536.**	
teres	**1,367** ;	123 ;	**1335.**	
Spermadictyon				
suaveolens ...	**1,554** ;	186 ;	**1364** ;	drawing missing ; Pl. Corom. 236 ; as *Hamiltonia suaveolens* in Flora Indica ; there is an unnumbered drawing which is almost a replica of t. 236.
Sphaeranthus 2162				
Indicus	**3,446** ;	608 ;	— ;	no drawing.
mollis	**3,446** ;	608 ;	**437.**	
Sphenoclea 739				
zeylanica ...	**1,507** ;	170 ;	**194.**	

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Spilanthes 2122				
Amella	**3,**410 ;	596 ;	**421.**	
oleracea	**3,**410 ;	596 ;	— ;	no drawing.
Spinacia 517				
tetrandra ...	**3,**771 ;	718 ;	**1091 ;**	Wight Ic. 818.
Spiraea 1383				
corymbosa ...	**2,**512 ;	407 ;	**949.**	
Spondias 1313				
acuminata ...	**2,**453 ;	387 ;	— ;	no drawing.
axillaris	**2,**453 ;	388 ;	**2062.**	
dulcis	**2,**452 ;	387 ;	**2061.**	
longifolia ...	**2,**453 ;	388 ;	— ;	no drawing.
mangifera ...	**2,**451 ;	387 ;	**50.**	
Stapelia 707				
adscendens ...	— ;	— ;	**216 ;**	Pl. Corom. 30 ; apparently omitted from Flora Indica.
umbellata ...	— ;	— ;	**1384 ;**	drawing missing ; Pl. Corom. 241 ; apparently omitted from Flora Indica ; there is an unnumbered drawing which resembles t. 241.
Stemodia 1717				
ruderalis ...	**3,**94 ;	490 ;	**962.**	
viscosa	**3,**94 ;	489 ;	**322 ;**	Pl. Corom. 163.
Sterculia 1784				
alata	**3,**152 ;	509 ;	**2314 ;**	Pl. Corom. 287.
angustifolia ...	**3,**148 ;	508 ;	**2532 ;**	No. 2526 on drawing.
Balanghas ...	**3,**144 ;	506 ;	**991.**	
coccinea ...	**3,**151 ;	509 ;	**2313.**	
colorata ...	**3,**147 ;	507 ;	**46 ;**	Pl. Corom. 25.
foetida	**3,**154 ;	510 ;	**2064.**	
guttata	**3,**148 ;	508 ;	**2138.**	
lanceaefolia ...	**3,**150 ;	508 ;	**2312.**	
parviflora ...	**3,**148 ;	508 ;	**2531 ;**	No. 2525 on drawing.
populnifolia ...	**3,**148 ;	508 ;	— ;	no drawing.
urens	**3,**145 ;	507 ;	**109 ;**	Pl. Corom. 24.
villosa	**3,**153 ;	510 ;	**1196.**	
Stilago 2518				
Bunius ...	**3,**758 ;	713 ;	**1704 ;**	Wight Ic. 819.
diandra	**3,**759 ;	714 ;	**107 ;**	Pl. Corom. 166.
lanceolaria ...	**3,**760 ;	714 ;	**2561 ;**	No. 2554 on drawing ; Wight Ic. 766.
tomentosa ...	**3,**757 ;	713 ;	**2402 ;**	Wight Ic. 767, 768.
Streptium 1710				
asperum ...	**3,**90 ;	488 ;	**336 ;**	Pl. Corom. 146.
Stroemeria 824				
tetrandra ...	**2,**78 ;	267 ;	**667.**	
trifoliata ...	**2,**79 ;	267 ;	**1798 ;**	on the drawing and in the Kew MS. the generic name is *Stroemia*.
Strychnos 622				
colubrina ...	**1,**577 ;	194 ;	**2194 ;**	Wight Ic. 434.
Nux-vomica ...	**1,**575 ;	193 ;	**41 ;**	Pl. Corom. 4.
potatorum ...	**1,**576 ;	194 ;	**42 ;**	Pl. Corom. 5.
Styrax 1275				
benzoin	**2,**416 ;	375 ;	— ;	no drawing.
serrulata ...	**2,**415 ;	375 ;	**2058.**	

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Swietenia 1256				
chickrassa ...	**2**,399 ;	370 ;	**1062.**	
chloroxylon ...	**2**,400 ;	370 ;	**26 ;**	Pl. Corom. 64.
febrifuga ...	**2**,398 ;	370 ;	**27 ;**	Pl. Corom. 17 ; also an unnumbered drawing different from No. 27.
Symphorema 1090				
involucrata ...	**2**,262 ;	326 ;	**141 ;**	Pl. Corom. 186.
Symplocos 1440				
fasciculata ...	— ;	— ;	**2510 ;**	no drawing ; not in Flora Indica apparently.
ferruginea ...	**2**,542 ;	416 ;	**2271.**	
flavescens ...	— ;	— ;	**2511 ;**	not in Flora Indica, it seems ; drawing numbered 2571, evidently by error.
racemosa ...	**2**,539 ;	415 ;	**1979.**	
spicata	**2**,541 ;	416 ;	**2270.**	
Tabernaemontana 644				
coronia	**2**,23 ;	249 ;	**1038 ;**	Wight Ic. 477.
corymbosa ...	**2**,25 ;	250 ;	— ;	no drawing.
crispa	**2**,24 ;	249 ;	**1039 ;**	Wight Ic. 470.
dichotoma ...	**2**,21 ;	248 ;	**1541** & **1811 ;**	Wight Ic. 433 ; the drawing of No. 1541, and the description of this number in the Kew MS., are named *Cerbera dichotoma* Roxb.
parviflora ...	**2**,25 ;	250 ;	**1812 ;**	Wight Ic. 393.
persicariaefolia ...	**2**,27 ;	250 ;	— ;	no drawing.
recurva	**2**,26 ;	250 ;	**1543 ;**	Wight Ic. 393.
Tacca 990				
aspera	**2**,169 ;	296 ;	**2218 ;**	Pl. Corom. 257 as *T. integrifolia.*
integrifolia ...	— ;	— ;	**2218 ;**	Pl. Corom. 257 ; in Flora Indica as *T. aspera.*
laevis	**2**,171 ;	297 ;	**2217.**	
pinnatifida ...	**2**,172 ;	297 ;	**1828.**	
Tagetes 2149				
erecta	**3**,435 ;	604 ;	— ;	no drawing.
patula	**3**,434 ;	604 ;	— ;	no drawing.
Talinum 1327				
cuneifolium ...	**2**,465 ;	391 ;	**2065.**	
Tamarindus 1875				
indica	**3**,215 ;	530 ;	**1081.**	
Tamarix 844				
dioica	**2**,101 ;	274 ;	**1390.**	
indica	**2**,100 ;	274 ;	**595.**	
Tectona 620				
grandis ...	**1**,600 ;	202 ;	**178 ;**	Pl. Corom. 6.
Terminalia 1290				
angustifolia ...	**2**,437 ;	382 ;	— ;	no drawing.
belerica	**2**,431 ;	380 ;	**2 ;**	Pl. Corom. 198.
Catappa ...	**2**,430 ;	380 ;	**1002.**	
chebula	**2**,433 ;	381 ;	**1** & **2060 ;**	Pl. Corom. 197.
citrina	**2**,435 ;	382 ;	**2251.**	
eglandulosa ...	See *T. moluccana.*			
gangetica ...	**2**,437 ;	382 ;	— ;	no drawing.

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Terminalia—*continued*				
moluccana ...	**2,**432 ;	381 ;	**1720 ;**	drawing named *Terminalia belerica* Roxb. ; Roxburgh says " For some time I gave this species the trivial name *eglandulosa* ; a specimen so named must have fallen into Willdenow's hand to have enabled him to quote me for that name." (Willd. L. Sp. Pl. iv. 968 : 1806).
procera	**2,**429 ;	380 ;	**1719 ;**	drawing missing ; Pl. Corom. 224 ; there is an unnumbered drawing which is almost identical with t. 224.
Ternstroemia 1419				
bilocularis ...	**2,**522 ;	410 ;	— ;	no drawing.
serrata	**2,**521 ;	410 ;	**2269.**	
Teta 986				
viridiflora ...	**2,**165 ;	295 ;	**1400.**	
Tetracera 1560				
euryandra ...	**2,**646 ;	449 ;	— ;	no drawing.
sarmentosa ...	**2,**645 ;	449 ;	**1451.**	
trigyna	**2,**645 ;	449 ;	**1450.**	
Tetranthera 2592				
apetala ...	**3,**819 ;	734 ;	**64 ;**	Pl. Corom. 147.
fruticosa ...	**3,**823 ;	735 ;	**2406.**	
lanceaefolia ...	**3,**823 ;	735 ;	**2405.**	
laurifolia... ...	**3,**823 ;	735 ;	— ;	no drawing.
macrophylla ...	**3,**822 ;	735 ;	**2571 ;**	no drawing.
monopetala ...	**3,**821 ;	735 ;	**65 ;**	Pl. Corom. 148.
nitida	**3,**818 ;	734 ;	**2404.**	
pentandra ...	**3,**824 ;	736 ;	**66 ;**	Pl. Corom. 187 as *Laurus involucrata.*
quadriflora ...	**3,**821 ;	735 ;	**2403.**	
Teucrium 1595				
stoloniferum ...	**3,**3 ;	459 ;	**1456.**	
Thalictrum 1585				
bracteatum ...	**2,**671 ;	458 ;	**1454.**	
Thuja 2397				
orientalis ...	**3,**653 ;	678 ;	— ;	no drawing.
Thunbergia 1634				
fragrans ...	**3,**33 ;	469 ;	**314 ;**	Pl. Corom. 67.
grandiflora ...	**3,**34 ;	470 ;	**959.**	
Torenia 1718				
cordifolia ...	**3,**95 ;	490 ;	**315 ;**	Pl. Corom. 161.
diffusa	**3,**95 ;	490 ;	**321.**	
hians	**3,**96 ;	490 ;	**1465.**	
multiflora ...	**3,**96 ;	490 ;	**1267 ;**	drawing named *Columnea multiflora.*
vagans	**3,**96 ;	490 ;	— ;	no drawing.
varians	**3,**96 ;	490 ;	**1269.**	
Tradescantia 933				
axillaris	**2,**118 ;	280 ;	**620 ;**	Pl. Corom. 107.
imbricata ...	**2,**120 ;	280 ;	**1130.**	
paniculata ...	**2,**119 ;	280 ;	**622 ;**	Pl. Corom. 109.
tuberosa ...	**2,**119 ;	280 ;	**621 ;**	Pl. Corom. 108.

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Tragia 2309				
cannabina ...	3,575 ;	651 ;	**269.**	
Chamaelea ...	3,577 ;	652 ;	— ;	no drawing.
involucrata ...	3,576 ;	652 ;	**270.**	
Mercurialis ...	3,576 ;	652 ;	**441.**	
Trapa 474				
bicornis	1,428 ;	143 ;	— ;	no drawing.
bispinosa ...	1,428 ;	144 ;	**1345 ;**	Pl. Corom. 234.
quadrispinosa ...	1,430 ;	144 ;	— ;	no drawing.
Trewia 2611				
nudiflora ...	3,837 ;	740 ;	**1000.**	
Trianthema 1306				
crystallina ...	2,444 ;	384 ;	**647.**	
decandra ...	2,444 ;	384 ;	**649.**	
obcordata ...	2,445 ;	385 ;	**648.**	
Tribulus 1258				
lanuginosus ...	2,400 ;	371 ;	— ;	no drawing.
Trichomanes				
campanulatum ...	— ;	763 ;	— ;	no drawing.
caruifolium ...	— ;	763 ;	— ;	no drawing.
lacinatum ...	— ;	763 ;	— ;	no drawing.
lucidum	— ;	763 ;	— ;	no drawing.
malayanum ...	— ;	763 ;	— ;	no drawing.
Trichosanthes 2452				
anguina ...	3,701 ;	694 ;	**1690.**	
cordata	3,703 ;	695 ;	**1691 ;**	drawing named *Trichosanthes tuberosa* Roxb.
cucumerina ...	3,702 ;	694 ;	**454.**	
dioica	3,701 ;	694 ;	**1090.**	
heteroclita ...	3,705 ;	695 ;	**2399.**	
lobata	3,703 ;	694 ;	**992.**	
palmata	3,704 ;	695 ;	**453.**	
Trifolium 2097				
indicum	3,388 ;	588 ;	**411.**	
officinale ...	3,388 ;	588 ;	**1166.**	
Trigonella 2098				
corniculata ...	3,389 ;	589 ;	**1167 ;**	Wight Ic. 384.
Foenum-Graecum	3,389 ;	588 ;	— ;	no drawing.
indica	3,389 ;	588 ;	**412.**	
Triosteum 811				
hirsutum ...	1,538 ;	181 ;	— ;	no drawing.
Triphasia 1005				
aurantiola ...	— ;	— ;	**144 ;**	apparently omitted from Flora Indica ; drawing has the name *Limonia trifoliata* on the verso.
Triticum 402				
aestivum ...	1,359 ;	120 ;	— ;	no drawing.
hybernum ...	1,359 ;	121 ;	— ;	no drawing.
Triumfetta 1324				
Bartramia ...	2,463 ;	391 ;	**1434.**	
trilocularis ...	2,462 ;	390 ;	**2066.**	

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Trophis 2521				
aspera	**3,**761 ;	714 ;	**118.**	
spinosa	**3,**762 ;	715 ;	**120.**	
Tunga 198				
diandra	**1,**184 ;	62 ;	— ;	no drawing.
laevigata ...	**1,**183 ;	62 ;	**702.**	
triceps	**1,**183 ;	61 ;	**701.**	
Typha 2299				
angustifolia ...	**3,**567 ;	649 ;	— ;	no drawing.
elephantina ...	**3,**566 ;	648 ;	**870.**	
Ulmus 900				
integrifolia ...	**2,**68 ;	263 ;	**133 ;**	Pl. Corom. 78.
lancifolia ...	**2,**66 ;	263 ;	**2210.**	
virgata	**2,**67 ;	263 ;	**1958.**	
Uncaria 806				
acida	**1,**520 ;	175 ;	— ;	no drawing.
cirrhifolia ...	**1,**520 ;	174 ;	— ;	no drawing.
Gambier ...	**1,**517 ;	173 ;	**1362 ;**	drawing named *Nauclea Gambier* R. ; also an unnumbered drawing very similar to No. 1362.
ovalifolia ...	**1,**519 ;	174 ;	**1218 ;**	drawing named *Nauclea scandens.*
pedicellata ...	**1,**520 ;	174 ;	— ;	no drawing.
pilosa	**1,**520 ;	175 ;	— ;	no drawing.
sclerophylla ...	**1,**520 ;	175 ;	— ;	no drawing.
sessilifolia ...	— ;	— ;	**2438 ;**	No. 2437 on drawing ; the species was apparently omitted from Flora Indica.
sessilifructus ...	**1,**520 ;	175 ;	**2437 ;**	no drawing ; in the Kew MS. the name is *U. sessilicarpa.*
Unona 1584				
discolor	**2,**669 ;	457 ;	**956** & **2295.**	
dumosa	**2,**670 ;	457 ;	**2294.**	
longiflora ...	**2,**668 ;	457 ;	**2293.**	
Urania 929				
speciosa ...	**2,**114 ;	279 ;	**1817/a** & **1817/b.**	
Urceola 642				
elastica ...	**3,**545 ;	641 ;	**1040 ;**	Wight Ic. 473 ; the account of this plant in the Kew MS. does not seem to be included in Flora Indica.
Urena 1834				
lobata	**3,**182 ;	519 ;	**1154.**	
palmata	**3,**182 ;	519 ;	— ;	no drawing.
repanda	**3,**182 ;	519 ;	**1882.**	
sinuata	**3,**182 ;	519 ;	**1155.**	
Urtica 2316				
acuminata ...	**3,**592 ;	657 ;	— ;	no drawing.
alienata ...	**3,**582 ;	654 ;	**1669 ;**	Wight Ic. 693.
bicolor	**3,**589 ;	656 ;	— ;	no drawing.
crenulata ...	**3,**591 ;	657 ;	**1673 ;**	Wight Ic. 686.
decumana ...	**3,**587 ;	656 ;	**1672.**	
frutescens ...	**3,**589 ;	656 ;	— ;	no drawing.
globulifer ...	**3,**593 ;	658 ;	— ;	no drawing.
heterophylla ...	**3,**586 ;	655 ;	**1671 ;**	Wight Ic. 687 ; drawing named *Urtica ferocissima* Roxb.
inaequalifolia ...	**3,**594 ;	658 ;	— ;	no drawing.
interrupta ...	**3,**585 ;	655 ;	**985 ;**	Wight Ic. 692.

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Urtica—*continued*				
involucrata ...	**3**,592 ;	657 ;	**2553 ;**	No. 2546 on drawing ; Wight Ic. 685.
lineata	**3**,589 ;	656 ;	— ;	no drawing.
minima	**3**,585 ;	655 ;	— ;	no drawing.
naucliflora ...	**3**,592 ;	657 ;	**2379 ;**	Wight Ic. 684.
paniculata ...	**3**,589 ;	656 ;	— ;	no drawing.
parviflora ...	**3**,581 ;	654 ;	**1909 ;**	Wight Ic. 690.
pentandra ...	**3**,583 ;	654 ;	**986 ;**	Wight Ic. 696.
pulcherrima ...	**3**,588 ;	656 ;	**2552 ;**	No. 2545 on drawing ; Wight Ic. 683.
scabrella ...	**3**,581 ;	653 ;	**2551 ;**	No. 2544 on drawing ; Wight Ic. 691.
sphaerocephala ...	**3**,589 ;	656 ;	— ;	no drawing.
suffruticosa ...	**3**,584 ;	655 ;	**2144 ;**	Wight Ic. 694 errore *U. fruticosa.*
tenacissima ...	**3**,590 ;	656 ;	**1670 ;**	drawing missing ; Wight Ic. 688.
trinervia ...	**3**,582 ;	654 ;	— ;	no drawing.
tuberosa ...	**3**,583 ;	654 ;	**231 ;**	Wight Ic. 697.
vescicaria ...	**3**,587 ;	655 ;	**232 ;**	Wight Ic. 695.
Utricularia 155				
biflora	**1**,143 ;	48 ;	**1204.**	
fasciculata ...	**1**,143 ;	48 ;	**1203.**	
stellaris	**1**,143 ;	48 ;	**529 ;**	Pl. Corom. 180.
Uvaria 1573				
axillaris	**2**,667 ;	456 ;	— ;	no drawing.
bicolor	**2**,662 ;	455 ;	**2521 ;**	No. 2515 on drawing.
bracteata ...	**2**,660 ;	454 ;	**2290.**	
cerasoides ...	**2**,666 ;	456 ;	**85 ;**	Pl. Corom. 33.
cordifolia ...	**2**,662 ;	455 ;	**2523 ;**	No. 2517 on drawing.
dioica	**2**,659 ;	454 ;	**2291.**	
fornicata ...	**2**,662 ;	455 ;	**2522 ;**	No. 2516 on drawing.
grandiflora ...	**2**,665 ;	456 ;	**2074.**	
heteroclita ...	**2**,663 ;	455 ;	**2524 ;**	No. 2518 on drawing.
longifolia ...	**2**,664 ;	455 ;	**954.**	
lutea	**2**,666 ;	456 ;	**88 ;**	Pl. Corom. 36.
macrophylla ...	**2**,663 ;	455 ;	— ;	no drawing.
nitida	**2**,667 ;	456 ;	— ;	no drawing.
odorata	**2**,661 ;	454 ;	**1986.**	
odoratissima ...	**2**,666 ;	456 ;	**955.**	
pilosa	**2**,665 ;	456 ;	— ;	no drawing.
suberosa ...	**2**,667 ;	456 ;	**86 ;**	Pl. Corom. 34.
tomentosa ...	**2**,667 ;	456 ;	**87 ;**	Pl. Corom. 35.
tripetala ...	**2**,667 ;	456 ;	**2292.**	
uncata	**2**,666 ;	456 ;	— ;	no drawing.
ventricosa ...	**2**,658 ;	453 ;	**1868.**	
villosa	**2**,664 ;	456 ;	**1250.**	
Vahlia 909				
oldenlandioides	**2**,89 ;	270 ;	**591 ;**	Wight Ic. 562.
viscosa	**2**,89 ;	270 ;	**592 ;**	Wight Ic. 563.
Valeriana 176				
Jatamansi ...	**1**,163 ;	55 ;	**910**	(no drawing) & **1017.**
Vallisneria 2509				
alternifolia ...	**3**,750 ;	711 ;	**996.**	
octandra ...	**3**,752 ;	711 ;	**475 ;**	Pl. Corom. 165.
spiraloides ...	**3**,750 ;	710 ;	— ;	no drawing.
verticillata ...	**3**,751 ;	711 ;	**679 ;**	Pl. Corom. 164 ; on an earlier page of Flora Indica (p. 578) this was described as *Serpicula verticillata.*

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Vangueria 776				
spinosa	**1**,536 ;	180 ;	**1032.**	
Vareca 840				
heteroclita ...	**1**,648 ;	218 ;	**1223.**	
lanceolata ...	**1**,648 ;	218 ;	**1126.**	
moluccana ...	**1**,647 ;	217 ;	**2447 ;**	no drawing.
Vateria 1513				
indica	**2**,602 ;	436 ;	**1564 ;**	Pl. Corom. 288.
lanceaefolia ...	**2**,601 ;	435 ;	**2276.**	
Ventilago 898				
Madraspatana ...	**1**,629 ;	211 ;	**582 ;**	Pl. Corom. 76.
Verbascum 545				
Thapsus	**1**,560 ;	188 ;	— ;	no drawing.
Verbena 157				
bonariensis ...	— ;	— ;	— ;	two unnumbered drawings different from one another.
jamaicensis ...	— ;	— ;	**1205 ;**	drawing named *Verbena dianthera* ; there is also an unnumbered drawing quite different from No. 1205.
nodiflora... ...	— ;	— ;	— ;	there is an unnumbered drawing named *Lantana indica* (which it is not) with the name "Verbena nodiflora" in pencil in what seems to be Roxburgh's hand.
Verbesina 2155				
biflora	**3**,440 ;	606 ;	— ;	no drawing.
Boswellia ...	**3**,443 ;	607 ;	— ;	no drawing.
calendulacea ...	**3**,440 ;	606 ;	**978.**	
Lavenia ...	**3**,442 ;	607 ;	**435.**	
sativa	**3**,441 ;	606 ;	**1644.**	
scandens ...	**3**,441 ;	606 ;	**979.**	
Vicia 2021				
Faba	**3**,323 ;	566 ;	— ;	no drawing.
sativa	**3**,323 ;	566 ;	**1162.**	
Vinca 643				
parviflora ...	**2**,1 ;	242 ;	**214.**	
rosea	**2**,1 ;	242 ;	— ;	no drawing.
Viola 842				
apetala ...	**1**,650 ;	218 ;	**2452 ;**	No. 2453 on drawing.
enneasperma ...	**1**,650 ;	218 ;	— ;	no drawing.
primulifolia ...	**1**,650 ;	218 ;	**2453 ;**	No. 2454 on drawing.
suffruticosa ...	**1**,649 ;	218 ;	**1807.**	
Viscum 2525				
confertum ...	**3**,764 ;	715 ;	— ;	no drawing.
monoicum ...	**3**,763 ;	715 ;	**1181.**	
opuntioides ...	**3**,764 ;	715 ;	— ;	no drawing.
verticillatum ...	**3**,764 ;	715 ;	— ;	no drawing.

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832).	Fl. Ind. (1874)	Roxb. No.	
Vitex 1681				
alata	**3**,72 ;	482 ;	**1463** ;	also an unnumbered drawing, marked " Ic. Roxb. " in pencil, which differs only slightly from No. 1463, and which bears the name " Vitex alata R." in pencil in Roxburgh's hand—at the bottom of the sheet he has written, in pencil, " Spare copy was sent home as No. 1463 in 1803–4."
altissima ...	**3**,71 ;	482 ;	**2078.**	
arborea	**3**,73 ;	482 ;	**52.**	
heterophylla ...	**3**,75 ;	483 ;	— ;	no drawing.
incisa	**3**,72 ;	482 ;	**1574** ;	also an unnumbered drawing, inscribed " Ic. Roxb." in pencil, which is a replica of No. 1574, it is named Vitex incisa in pencil in Roxburgh's autograph.
Leucoxylon ...	**3**,74 ;	483 ;	**1573.**	
Negundo ...	**3**,70 ;	481 ;	**334.**	
paniculata ...	**3**,71 ;	482 ;	— ;	no drawing.
saligna	**3**,75 ;	483 ;	**2300.**	
trifolia	**3**,69 ;	481 ;	**2301.**	
Vitis 831				
indica	**1**,660 ;	221 ;	**2192.**	
lanata	**1**,660 ;	222 ;	**584.**	
latifolia	**1**,661 ;	222 ;	**1224.**	
parvifolia ...	**1**,662 ;	222 ;	**2450** ;	No. 2451 on drawing.
Vittaria				
divergens ...	— ;	759 ;	— ;	no drawing.
interrupta ...	— ;	760 ;	— ;	no drawing.
lineata	— ;	759 ;	**1755.**	
lunulata	— ;	760 ;	— ;	no drawing.
parasitica ...	— ;	760 ;	— ;	no drawing.
resecta	— ;	760 ;	— ;	no drawing.
Volkameria 1667				
Buchanani ...	**3**,60 ;	478 ;	**1265** ;	drawing named *Clerodendrum Buchananii*.
dentata	**3**,61 ;	478 ;	**2303.**	
farinosa	**3**,63 ;	479 ;	— ;	no drawing.
herbacea ...	— ;	— ;	**1873** ;	in Roxb. Hort. Beng. 46, but not, apparently, in Flora Indica.
infortunata ...	**3**,59 ;	478 ;	**92.**	
kaempferi ...	**3**,60 ;	478 ;	**965.**	
nereifolia ...	**3**,64 ;	479 ;	**2530** ;	No. 2524 on drawing.
obovata ...	**3**,62 ;	479 ;	— ;	no drawing.
odorata	— ;	— ;	**1874** ;	in Roxb. Hort. Beng. 65, but not apparently in Flora Indica.
serrata	**3**,62 ;	479 ;	**1473** ;	also an unnumbered drawing, a replica of No. 1473, which is marked " Ic. Roxb. " in pencil.
urticifolia ...	**3**,61 ;	479 ;	**2302.**	
Wallichia				
caryotoides ...	**3**,621 ;	667 ;	**1682** ;	Pl. Corom, 295 ; in Flora Indica as *Wrightea caryotoides*.
Walsura 1241				
piscidia	**2**,387 ;	366 ;	**47.**	
robusta	**2**,386 ;	366 ;	**2245.**	
ternata	**2**,389 ;	366 ;	**646.**	

Name and page-no. in Fl. Ind. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Webera 745				
corymbosa ...	**1**,696 ;	234 ;	**14 ;**	Wight Ic. 584.
macrophylla ...	**1**,697 ;	234 ;	**2046.**	
odorata	**1**,699 ;	234 ;	**2458 ;**	No. 2459 on drawing.
oppositifolia ...	**1**,698 ;	234 ;	— ;	no drawing.
scandens ...	**1**,698 ;	234 ;	**2459 ;**	No. 2460 on drawing.
Willughbeia 626				
edulis	**2**,57 ;	260 ;	**2206 ;**	Pl. Corom. 280.
Wrightea 2361				
caryotoides ...	**3**,621 ;	667 ;	**1682 ;**	Pl. Corom. 295 as *Wallichia caryotoides*.
Xanthium 2338				
indicum	**3**,601 ;	660 ;	**442.**	
Xanthochymus 1545				
dulcis	**2**,631 ;	445 ;	**1861 ;**	Pl. Corom. 270 ; Wight Ic. 192.
ovalifolius ...	**2**,632 ;	445 ;	**2277.**	
pictorius ...	**2**,633 ;	445 ;	**38 ;**	Pl. Corom. 196.
Xanthophyllum 1045				
flavescens ...	**2**,222 ;	313 ;	**2227 ;**	Pl. Corom. 284.
virens	**2**,221 ;	313 ;	**2226 ;**	Pl. Corom. 284.
Ximenia 1078				
aegyptiaca ...	**2**,253 ;	323 ;	**174.**	
americana ...	**2**,252 ;	323 ;	**209.**	
Xylocarpus 1065				
Granatum ...	**2**,240 ;	319 ;	**2483 ;**	No. 2481 on drawing.
Xyris 193				
indica	**1**,179 ;	60 ;	**1021.**	
Zanthoxylon 2530				
alatum	**3**,768 ;	717 ;	**1916.**	
Zea 2301				
Mays	**3**,568 ;	649 ;	— ;	no drawing.
Zingiber 53				
capitatum ...	**1**,55 ;	19 ;	**1509 ;**	drawing named *Amomum capitatum* Roxb.
Cassumunar ...	**1**,49 ;	17 ;	**501** & **1507 ;**	No. 1507 is named *Amomum zanthorhiza* Roxb. ; there is also an unnumbered drawing almost identical with No. 1507.
elatum	**1**,57 ;	19 ;	**2159.**	
ligulatum ...	**1**,51 ;	18 ;	**1760 ;**	Pl. Corom. 253 ; drawing has No. 1764, evidently by mistake.
marginatum ...	**1**,57 ;	19 ;	— ;	no drawing.
officinale ...	**1**,47 ;	16 ;	**1101.**	
panduratum ...	**1**,55 ;	19 ;	**2006.**	
roseum	**1**,50 ;	17 ;	**502.**	
rubens	**1**,53 ;	18 ;	**1927.**	
squarrosum ...	**1**,54 ;	18 ;	**1928.**	
Zerumbet ...	**1**,48 ;	17 ;	**1102.**	
Zinnia 2150				
bidens	**3**,435 ;	604 ;	**436.**	

Name and page-no. in Fl. Iud. MS.	Fl. Ind. (1832)	Fl. Ind. (1874)	Roxb. No.	
Zizyphus 885				
albens	**1,**607 ;	204 ;	**1372.**	
Caracutta ...	**1,**612 ;	206 ;	**1803.**	
elliptica ...	**1,**610 ;	205 ;	[**2449**] ;	in the Kew MS. No. 2449 is *Euonymous atropurpurea*, the drawing of which was numbered 2450 ; evidently the description of *Zizyphus elliptica* was not included in, or deleted from the MSS. at some point.
glabra	**1,**614 ;	206 ;	— ;	no drawing.
incurva	**1,**614 ;	206 ;	— ;	no drawing.
Jujuba	**1,**608 ;	204 ;	**578.**	
latifolia	**1,**608 ;	204 ;	**581.**	
Lotus	**1,**610 ;	205 ;	— ;	no drawing.
microphylla ...	**1,**613 ;	206 ;	**1222 ;**	drawing is named *Rhamnus microphyllus*.
Napeca	**1,**613 ;	206 ;	**580 ;**	in the Kew MS. Roxburgh has crossed out the name *Z. napeca* and substituted *Z. scandens* Roxb.
nitida	**1,**609 ;	205 ;	**921.**	
Oenoplia ...	**1,**611 ;	205 ;	— ;	no drawing.
scandens ...	— ;	— ;	**580 ;**	name published in Roxb. Hort. Beng. 17 ; as *Z. napeca* in Flora Indica.
tomentosa ...	**1,**611 ;	205 ;	— ;	no drawing.
trinervia ...	**1,**606 ;	205 ;	**2042.**	
vulgaris	**1,**609 ;	204 ;	— ;	no drawing.
xylopyrus ...	**1,**611 ;	205 ;	**579.**	
Undetermined ...	— ;	— ;	**2533 ;**	the description of No. 2533 in the Kew MS. is headed " New Undetermined Genus " ; the drawing is inscribed " No. 2527 ", in ink, and " Undetermined ", in pencil, and obviously belongs to No. 2533 of the MS. ; No. 2527 of the MS. is *Prasium melissifolium* Roxb. The plant (figured and) described as No. 2533 is *Eriolaena Wallichii* DC.

The Doubtful Roxburgh Drawings.

These, as mentioned above (p. 302–3), comprise two sets of drawings numbered respectively " 1 " to " 25 " and " No. 1 " to " No. 25 ", which bear the printed " Icones Roxburghianae " slip, but which do not belong to the regular set of Roxburgh drawings. Many of them bear names which have not been published, and all of these that have been traced (and some of the published names as well) are found to be associated with one or other of the " Madras " botanists, Heyne, Rottler, Klein and Roxburgh, as will be evident from the notes below. These botanists were all in contact with one another, and belonged to the " Brotherhood " which worked on the flora of southern India towards the end of the eighteenth century (see Wight and Arnott, Prodr. Fl. Penins. Ind. Or. **1,** xi : 1834). The drawings evidently represent plants collected by these botanists and bear the names provisionally given by them. Nothing is known of the provenance of the drawings. On the verso of " 1. Gratiola

montana "is written in ink " 25 Drawings of Plants. Recd. from the Secretary's Office. 27th May 1808 ", but there is nothing else on any of the drawings which might be a clue to their origin. The fact that, like the known Roxburgh drawings, they are drawn life-size on folio sheets, and have dissections which, like the main figure, are coloured, suggests that the printed " Icones Roxburghianae " slip affixed to them, is a correct attribution. Roxburgh's earlier collections are said to have been " destroyed by an inundation " (King in Ann. Roy. Bot. Gard. Calcutta, **5,** 8 : 1895) and it is possible that the drawings enumerated below may have been all that was saved of Roxburgh's earliest botanical labours. The drawings, in numerical order, are as follows.

1. **Gratiola montana.** Name attributed to Rottler, " in litt.", in DC. Prodr. **9,** 268 (1845). The plant is *Didymocarpus rottleriana* Wall.

2. **Justicia ruelloides.** Name not traced. Quid ?

3. **Crotalaria fruticosa.** Name attributed to " Herb. Madr." in Wallich, Cat. No. 5374, and on the tickets with specimens, one of them collected by Heyne, under that number. It is *C. pulcherrima* Roxb.

4. **Clivia laccifera.** Name on label with a Heyne specimen in Herb. Wallich. No. 967. *Shorea talua* Roxb.

5. **Barleria dianthera.** *B. dianthera* Heyne *fide* specimen in Herb. Wallich. No. 2391. *Barleria montana* Nees.

6. **Bignonia suberosa.** Quite unlike *B. suberosa* Roxb. (for which see Pl. Corom. t. 214) and probably so named by error. It seems to be *Bignonia crispa* Buch. ex Roxb., i.e. *Dolicandrone crispa* (Buch. ex Roxb.) Seem.

7. **Sterculia monocarpos.** Name not traced. The plant is *S. populifolia* [Roxb. ex] Wall. = *Hildegardia populifolia* (Wall.) R. Br.*

8. **Phlomis mysorensis.** *P. mysorensis* Heyne fide specimen in Herb. Rottler. *Leucas martinicensis* R. Br. (?).

9. **Ruellia glutinosa.** Name attributed to Roxburgh by Nees in DC. Prodr. **11,** 261 (1847), and on the label of a Heyne specimen in Herb. Rottler. where it is corrected to *R. imbricata* Roxb. The plant is *Phaylopsis parviflora* Willd.

10. **Vitex alata.** Seems to be *V. alata* Heyne.

11. **Salix decandra.** Name not traced. Seems to be *S. tetrasperma* Roxb.

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* This is the south Indian plant which was named *Sterculia populnifolia* by Roxburgh in his Hort. Beng. 50 (1814) nomen nudum, and Fl. Ind. **3,** 148 (1832). It was first described by De Candolle (Prodr. **1,** 483 : 1824) as *S. populifolia* DC. var. *acutiuscula*. Wallich (Pl. As. Rar. **1,** 3 : 1829) regarded it as specifically distinct from *S. populifolia* DC. var. *populifolia*—the type of which came from the island of Timor—and, giving priority to Roxburgh, reserved the name *S. populifolia* for the Indian plant, and renamed the one from Timor as *S. candollii*—a highly irregular proceeding under our modern Code of Nomenclature. Whether or not the Indian plant is a distinct species cannot be decided until material of the Timor plant is available for examination. If it should prove to be distinct, it will, presumably, have to receive a new epithet.

12. **Kaempfera rotunda.** Is *K. rotunda* L.

13. **Polygala secunda.** Name not traced. Probably *P. elongata* Klein.

14. **Dimocarpus tuberculata.** Name not traced. The plant is *Euphoria longana* Lam.

15. **Sida acuminata.** In Herb. Rottler. there are specimens from Heyne named " Sida acuminata Nob." Is *Abutilon polyandrum* G. Don.

16. Drawing missing.

17. **Tradescantia paniculata.** Not *T. paniculata* Roxb., which is *Floscopa scandens* Lour., nor *T. paniculata* Roth which is *Aneilema montana* Wight. Seems to be *Murdannia* (*Aneilema* sens. lat.) *sp.*

18. **Phlomis scabra.** Name not traced. Seems to be *Leucas aspera* Spreng.

19. **Teucrium paniculatum.** Name is attached to specimens from " Herb. Madras." and Herb. Klein. in the Wallich Herbarium, no. 2025. These, and the drawing, are *Teucrium tomentosum* Heyne.

20. **Ruellia guttata.** Not *R. guttata* Forsk. and not identified. The epithet obviously refers to the fact that all the vegetative parts are minutely spotted.

21. **Origanum album.** Not *O. album* Salisb. The plant resembles *Anisochilus dysophylloides* and also *Dysophyllus auriculatus.*

22. **Crotalaria hirsuta.** Not *C. hirsuta* Willd. but *C. stipulacea* Roxb., the original Roxburgh drawing of which (no. 1595) bears the name *C. hirsuta* Roxb.

23. **Amyris dichotoma.** The name " Amyris dichotoma Nob." is on a specimen (from Heyne ?) in Rottler's herbarium. The plant is *Commiphora caudata* (W. & A.) Engl. (syn. *Protium caudatum* Wight & Arnott).

24. **Antirrhinum diffusum.** The name is from Herb. Heyne. fide Wall. Pl. As. Rar. **2,** 43 (1831). The plant is *Linaria ramosissima* Wall.

25. **Anthemis oleracea.** Name not traced. The drawing represents *Guizotia abyssinica* (L.f.) Less.

No. 1. **Jasminum humile.** Is *J. humile* L.

No. 2. **Justicia nummularifolia.** Rottler MS. in Herb. Wallich. No. 2461. It is *Andrographis serpyllifolia* (Vahl) Wight.

No. 3. **Piper succulentum.** Name not traced. The drawing is of *Peperomia portulacoides* (Lam.) A. Dietr.

No. 4. **Piper pereskiaefolia.** Not *P. pereskiaefolia* Jacq., but *Peperomia reflexa* A. Dietr.

No. 5. **Anagallis erecta.** Name not traced. The plant is *A. arvensis* subsp. *coerulea* (Schreb.) Schinz & Keller.

No. 6. Drawing missing.

No. 7. **Convolvulus chalybina.** Name not traced. Perhaps *Lettsomia elliptica* Wight.

No. 8. **Ipomoea baccifera.** Name attributed to Herb. Russell. in Steudel, Nom. ed. 2, **1,** 815 (1840) where it is cited as a synonym for *Argyreia tiliaefolius* (Lam.) Wight. The drawing seems to be *Lettsomia aggregata* Roxb.

No. 9. **Lobelia nicotianifolia.** Name attributed to Heyne by Roxburgh, Fl. Ind. **1,** 506 (1832).

No. 10. **Clausena javensis.** *C. javensis* Juss. on Heyne specimens in Herb. Rottler., and in Herb. Wallich. No. 8510. The drawing is *C. dentata* (Willd.) Roem.

No. 11. **Polygonum baccatum.** Name not traced. Perhaps *P. chinense* L.

No. 12. **Melia baccifera.** *M. baccifera* Roxb. ex Roth. A specimen in Herb. Rottler. has the name *Melia baccifera* Roxb. altered to *M. baccata.* The correct name is *Cipadessa baccifera* (Roth) Miq. (syn. *C. fruticosa* Bl.).

No. 13. **Simaba aculeata.** *S. aculeata* Heyne in Herb. Rottler. and in Herb. Wallich. No. 6853. The plant is *Fagonia cretica* L.

No. 14. **Cotyledon corymbosum.** A specimen so named is in Herb. Rottler. and the name is attributed to Herb. Rottl. by Wight and Arnott, Prodr. Fl. Penins. Ind. Or. 360 (1834). The plant is *Kalanchoe floribunda* Wight & Arnott.

No. 15. **Rubus mysorensis.** Attributed to Heyne in Wallich, Cat. No. 1003. It is *R. lasiocarpus* Sm.

No. 16. **Leonurus tartaricus.** *L. tartaricus* of Burm. Fl. Ind. 127 (1768) and Roxb. Fl. Ind. **3,** 8 (1832) not of Linnaeus. It is *L. sibiricus* L.

No. 17. **Hyssopus orientalis.** Not *H. orientalis* Adams ex Willd. Seems to be *Pogostemon plectranthoides* Desf.

No. 18. **Mentha pinnatifida.** This is *Lavandula burmanni* Benth., and there is a specimen in Rottler's herbarium named *Sideritis pinnatifida* Nob. with a note from Klein which reads " Sub nomine Mentha pinnatifida ab amiciss. Heyneo missa . . . . "

No. 19. **Plectranthus ternatus.** Not *P. ternatus* Sims. It is *P. cordifolius* D. Don.

No. 20. **Origanum scutellarioides.** Name not traced. The plant seems to be *Coleus spicatus* Benth.

No. 21. **Lantana strobilifera.** Name attributed to Heyne in Rottler's Herbarium Catalogue. Is *L. indica* Roxb.

No. 22. **Barleria mysorensis.** Is B. *mysorensis* Roth and agrees with specimens in Rottler's herbarium so named.

No. 23. **Clerodendron papilionaceum.** Name not traced. Seems to be *C. serratum* (L.) Spreng.

No. 24. **Thunbergia erecta.** Name attributed to " Herb. Madras." by Wallich, Pl. As. Rar. **2,** 52 (1831). Is *Meyenia hawtayneana* (Wall.) Nees.

No. 25. **Sida heterophylla.** Name attributed to Heyne in Wight and Arnott, Prodr. Fl. Penins. Ind. Or. 55 (1834). There is a specimen named " Sida heterophylla Nob." in Herb. Rottler. probably received from Heyne. It is *Hibiscus solandra* L'Hérit.

A Guide to Wild Flowers.*—This portable and moderately priced volume maintains the high standard set by recent popular books on British plants. It is detailed and comprehensive, including the vast majority of species described in recent scientific literature, and in addition, a small number of aliens and recent discoveries which have not yet been widely publicized. The nomenclature is distinctly modish ; the descriptions are concise, and, on the whole, lucid (though it is sad to see *glabrous* replaced by " hairless " when " bald " is just as Anglo-Saxon and four letters shorter) ; the illustrations are generous and attractive, arranged by colour or in readily recognizable groupings so that the novice can make full use of them for indentifications. Such good value disarms the critic, and it is perhaps unkind to find fault with keys which seem, to the professional botanist, to have been designed with a view to straining the user's patience to its utmost limits. Surely an ordinary indented or dichotomous key could have achieved the same result without making it necessary to follow so many false trails ?

The English names are again a source of mild irritation to one who believes that only a " popular " plant can have a " popular " name. No one will object to Hogweed or Ramsons, and many are prepared to tolerate Curled Dock and Cross-leaved Heath, but why *Kentish* Milkwort for *Polygala* AUSTRIACA, *Scottish* Lupin for *Lupinus* NOOTKATENSIS and (horresco referens) *Esthwaite* Waterweed for *Hydrilla* LITHUANICA ? This is insularity carried to the point of absurdity. Equally distressing is the sly pawkiness of Dumpy Centaury, Bargeman's Cabbage and Gingerbread Sedge, and even the masochists must writhe when faced with the twin terrors of *Orthilia secunda* or " Yavering Bells "—obviously a plant to be looked for in some desolate recess of Wuthering Heights !

R. D. MEIKLE.

* The Pocket Guide to Wild Flowers, by David McClintock and R. S. R. Fitter. London. Collins. 1956. Pp. 340. Illustr. Price 25/-.

Dr. F. Börgesen 1866–1956

Botanists in general and algologists in particular have suffered a great loss with the death, on 22nd March 1956, of the well known Danish botanist Dr. Frederik Börgesen. He had reached the age of 90 and was actively engaged on algal taxonomy almost to the end of his life, the last part of "Marine Algae from Mauritius" having been published as recently as 1954.

Throughout his botanical career Dr. Börgesen was attached to the Botanical Museum in Copenhagen, where in addition to his activities as an algologist, he held the post of librarian from 1900 to 1935. His better known publications were the result of extensive travel, and perhaps the more notable of his journeys were the early ones of 1892 to 1906 when he made several trips to the West Indies and the Færoes. The investigations in the West Indies culminated some years later in the production of a critical account (running into some 700 pages) of the marine algae of that area. To the taxonomist this work was invaluable, for it was the first algal flora of the Tropical Atlantic. The account of the Færoes Marine Algae has also become a much quoted classic ; this detailed flora, with the same format as that of the Danish West Indies, had a supplementary ecological account written when ecology was still very much of a novelty. The last part of the West Indies Algal Flora was published in 1920 — no sooner had it appeared than the author set out for the Canary Islands to collect material for a work on the algae of these islands ; this work occupied Dr. Börgesen's attention for the next 5 years, the finished flora appearing in the years 1925–30. Not content with these achievements Dr. Börgesen next turned his attention eastwards, and between 1931 and 1938 wrote a series of papers on the algae of the Indian Ocean, from the Persian Gulf to Ceylon. These were followed by studies on the flora of Mauritius, another great undertaking which kept this renowned algologist interested and active to the end of his long and busy life.

Though primarily interested in the marine algae, Dr. Börgesen also found time to study the phanerogamic vegetation of the regions he visited and published notes on the flowering plants of the Danish West Indies and the Færoes.

All his work is marked by an unusual degree of confidence and candour —he was not held back by the fear of making mistakes. His lavishly illustrated floras with their lucid descriptions, drawn largely from his own observations in the field or in the laboratory, compare very favourably with some of the more arid publications of recent years.

Such a busy life left little time for hobbies, but Dr. Börgesen was an enthusiastic gardener, devoting much thought and energy to the garden of his home at Hellebaek. This interest kept him in touch with many well known horticultural institutions—even in his 80's he was sending *Rhododendron* species to Kew for identification.

To the writer he was a most kindly and helpful correspondent over a period of about 25 years to within a few months of his death.

C. I. Dickinson.

SOME XYLARIAS OF TROPICAL AMERICA.

R. W. G. Dennis

Because Xylarias are abundant in most tropical countries and are easy to preserve they have been freely collected and brought to Europe for naming by herbarium mycologists quite unfamiliar with them in the field. All the species are somewhat prone to variation in shape and stature and the early diagnoses were as a rule so inadequate that it is difficult to form any clear concept of species from them. Hence many of the common species have received several different names from different workers until there are at present over 400 specific epithets applied to Xylarias in the literature and the number of good species is quite unknown.

The European species were mostly well defined by Persoon as long ago as 1799 and his coloured figures are still among the best illustrations of their gross morphology. The Tropical American species were largely described by Montagne (1840–1855) but unfortunately he figured only a few and subsequent authors have found it easier to describe them afresh under new names rather than to learn Montagne's species. Probably the first mycologist to make a serious effort to interpret the old names was the late C. G. Lloyd and though he largely discounted microscopic characters his published opinions on synonymy are often helpful. Unfortunately his published notes are very scattered and difficult to understand until one has already obtained some familiarity with the more common species. He also published a large number of binomials in *Xylaria*, usually without adequate diagnoses, often merely to provide a label in his herbarium for some aberrant specimen of a species with which he was already familiar. More recently numerous American *Xylaria* exsiccati have been critically determined by J. H. Miller and examples of some of these at Kew have been helpful in fixing concepts of the older species.

In endeavouring to name the Tropical American material at Kew I have re-examined the numerous type collections of *Xylaria* species in the Berkeley, Cooke and Massee herbaria. Authentic material of many of Montagne's and Léveillé's species is also available here and a number of species described by Lloyd were based on collections at Kew. Other type specimens have been most kindly sent on loan from the Museum National d'Histoire naturelle, Paris, from New York Botanical Garden, from the Farlow Herbarium, the Spegazzini Herbarium and the Lloyd Herbarium but it has not been possible to examine the types of all published *Xylaria* names. In particular there are a number of old names proposed by Fries which have fallen out of use because of the inadequate descriptions provided by him. Some of these were based on Tropical American collections and if Fries' types come to light some of his names may have to be adopted in place of those used below.

While the general habit of a *Xylaria* species is usually fairly characteristic there is often wide variation in size and even in shape of the stroma, especially in the degree of lobing or branching. The presence of an apiculate apex to the stroma, free from perithecia and often bearing conidia, is a fairly constant and useful character, especially in the smaller

species, but it too may be obscured in fully mature stromata, so that specimens with and without a pointed tip may occur in the same collection. The nature of the stalk, whether strap-like or cylindrical, is also a fairly reliable feature. The most reliable specific characters are those of the ascospores and of the stromatic surface. The latter may be covered by a thin fibrous layer which splits in a characteristic manner to expose the ostioles or, if there is no such layer, the colour of the crust, the manner in which it cracks at maturity, the degree of protuberance of the perithecia and especially the shape of their ostiolar papillae are all important characters. Nearly all the species have a white or pale buff flesh in the stroma but in *X. dealbata* the flesh becomes black throughout. In most of the large tropical species the stroma becomes hollow at maturity but this is apparently a function of age and too much stress must not be laid on it in diagnoses. All the species have uniseriate nonseptate ascospores, more or less flattened, with one edge much straighter than the other and the ascospores are always dark brown or nearly black at maturity. In a few species the ascospores are sharply apiculate and in a few they have hyaline appendages. Unfortunately the ascospores of old herbarium material tend to be broken and hence less stress is laid on details of their morphology than would probably be appropriate of abundant fresh material of all the species were available.

One of the most interesting features of the genus is the occurrence of groups of species, very similar in gross morphology, which can be arranged in series of increasing ascospore size. Examples are the series :

X. multiplex, *X. arbuscula*, *X. apiculata*

X. feejeensis, *X. longipes*, *X. scruposa*

Poronia leporina, *X. tulasnei*, *X. chardoniana*, *X. pedunculata.*

In the following account the Tropical American species are arranged in several groups defined largely by gross morphology but the variability of the individual species results in the groups being somewhat difficult to separate in some instances. Several of the species still recognised are represented only by their type collections and it may well be that when more abundant material becomes available they will be shown to be abnormal states or developmental stages of better known Xylarias.

Group 1. Perithecia in a compact cluster on a wiry axis, growing on fallen leaves.

Xylaria aristata *Mont.* in Ann. Sci. Nat. Bot. Ser. 4, **3,** 106 (1855).

Axis slender, about 0·5 mm. thick, blackish-brown, densely clothed with fine erect hairs, crowned by a subglobose stroma up to 2 mm. across, its outline slightly undulating owing to slight protrusion of the perithecia, crust smooth, dark grey, the ostioles minutely papillate, black. Ascospores 9–10 × 4·5–5μ. Fig. 1.

On fallen leaves.

French Guiana : authentic material from Montagne in Herb. Berkeley.

Florida : Coconut Grove, R. Thaxter, det, J. H. Miller 8706.

The portion of Montagne's material at Kew is sterile but he evidently had other fertile specimens as he described the ascospores as " fuscae, minutae, majores vix centimillimetrum longitudine metientes ". Wright 299 and 514, so named by Berkeley, are also sterile but presumably do not belong here as their stalks are perfectly smooth. Theissen described a var. *hirsuta* on *Psidium* leaves in south Brasil with ascospores 14–20 × 7–9μ.

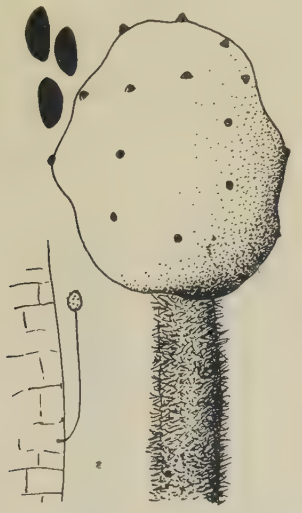

FIG. 1. *Xylaria aristata* Mont. Stroma natural size and enlarged, ascospores × 660, from Miller 8706.

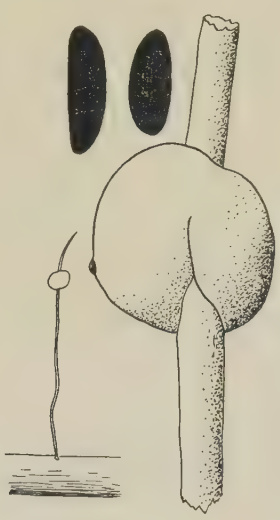

FIG. 2. *Xylaria axifera* Mont. Stroma natural size and enlarged, ascospores × 660, ex herb. Montagne.

Xylaria axifera *Mont.* in Ann. Sci. Nat. Bot. Ser. 4, **3,** 107 (1855).

Axis long, slender, bristle-like, about 0·5 mm. thick, whitish, then brown shading into black at the base, minutely and sparsely downy, bearing near the tip a more or less globose cluster of a few, large, confluent, perithecia, the whole 2–4 mm. across, with a smooth dark brown crust and small, convex, ostiolar papillae. Ascospores 20–25 × 6·8μ. Fig. 2.

On fallen petioles.

French Guiana : authentic material from Montagne in Herb. Berkeley.

Cuba : Wright 510 and Fungi Cubenses Wrightiani 798.

Trinidad : Emperor Valley, Port of Spain, R. Thaxter, det. J. H. Miller 8709, on *Panax*.

The material from Cuba and Trinidad is all sterile but is easily recognisable as this characteristic species.

Group 2. Perithecia almost free, arranged along a wiry axis.

Xylaria melanura (*Lév.*) *Sacc.* Syll. Fung. **9,** 537 (1891).

Chaenocarpus melanurus Lév. in Ann. Sci. Nat. Bot. Ser. 4, **20,** 294 (1863).

Xylaria chordaeformis Lloyd in Mycological Notes, 5; Xylaria Notes, 18, Dec. 1918.

Axis bristle-like, up to 3 cm. long, less than 0·5 mm. thick, cylindrical and whitish above, becoming strap-like, smooth and black below, unbranched; perithecia quite superficial, 1 mm. diameter, arranged in a single row, globose, black, with a slightly rugose surface and large, conical, ostiolar papilla. Ascospores 28–32 × 9–11 μ somewhat pointed at each end. Fig. 3.

On dead trunks.

FIG. 3. *Xylaria melanura* (Lév.) Sacc. Stromata natural size and enlarged, ascospores × 660, from Lindig 2597.

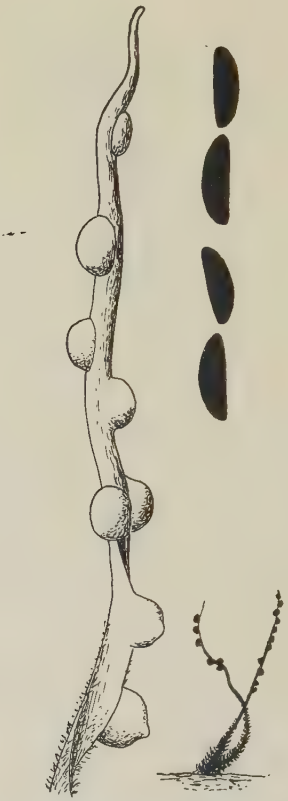

FIG. 4. *Xylaria juruensis* P. Henn. Stromata natural size and × 7, ascospores × 660, from Ule 2860.

Colombia: La Mesa, San Antonio, 1900 m., in June, Lindig 2597, type number of *X. melanura*.

Brasil: Bahia, leg. C. Torrend, typus of *X. chordaeformis* in Herb. Lloyd.

Otherwise similar material from Papua (Carr 15221) has the axis up to 7 cm. long and perithecia 1·5 mm. across.

Xylaria juruensis *P. Henn.* in Hedwigia **43,** 262 (1904).

This differs from the preceding in its smaller ascospores, 15–18 × 4–5μ and shorter axis with strigose base. I have seen only part of the type number, viz :

Brasil : Auf vermodertem Palmwedel, Jurua Miry, Estado de Amazonas, June 1901, Ule Herbarium Brasiliense 2860. Fig. 4.

Xylaria schwackei *P. Henn.* in Hedwigia 34, 108 (1895).

Xylaria vagans Petch in Ann. roy. bot. Gard. Peradeniya 6, 68 (1915).

Like a small slender state of *X. melanura* but with ascospores 12–14 × 4–5μ.

Brasil : on herbaceous stem, Rio de Janeiro, 10.7.1887, Schwacke 5723.

This is very like the fungus issued by Desmazières as *X. filiformis* (Alb. & Schwein.) Fr. but has a more strap-like axis. The original figure of Albertini and Schweinitz's species depicts a much stouter axis with seven rows of perithecia.

Compare also *X. inaequalis* and other species with somewhat dispersed perithecia in group 6.

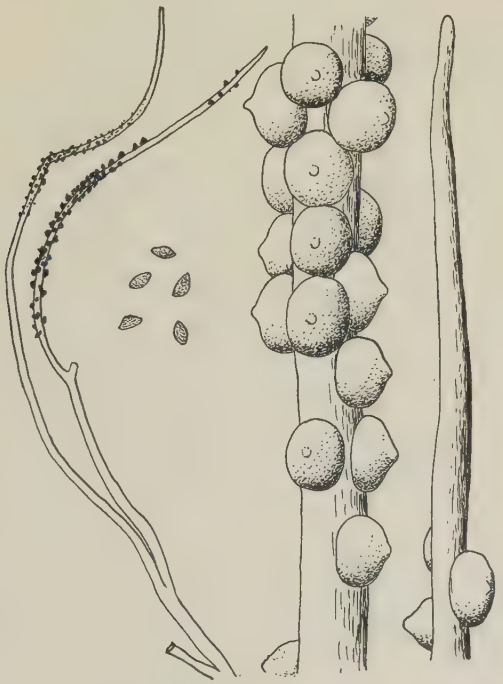

Fig. 5. *Xylaria rhizomorpha* (Mont.) Mont. Stroma natural size and enlarged, ascospores × 660.

Group 3. Terrestrial species with strongly mammiform perithecia and ascospores small to very small, some or possibly all associated with termite nests.

Xylaria rhizomorpha (*Mont.*) *Mont.* in Ann. Sci. Nat. Bot. Ser. 4, **3,** 107 (1855).

Hypoxylon rhizomorpha Mont. in Ann. Sci. Nat. Bot. Ser. 2, **13,** 341 (1840).

Rhizomorpha guyanensis Fr. Summa Veg. Scand. Sect. Post. 382 (1849).

Axis very long and slender, repeatedly branched, terete, about 2 mm. thick below, branches tapering to a point, surface smooth, dark purplish brown, bearing near the tips numerous, superficial, subglobose, smooth, concolorous perithecia, scattered or in clusters, with well-marked ostiolar papillae ; flesh white, solid. Ascospores brown, translucent, 5 × 2·25–2·5μ. Fig. 5.

On the ground in forests.

French Guiana : Leprieur 234, May 1836, typus in Herb. Paris.

If this be a good species and not an aberrant state of *X. brasiliensis* it must be very rare. Montagne (1855) had seen only a single specimen and during the past century no collection which could be referred here has been received at Kew. Meyer (1949), however, listed *X. rhizomorpha* from Panama, from a determination by Miller. Judging by the description *X. scoparia* Pat., from Indochina, may be the corresponding species in the eastern tropics.

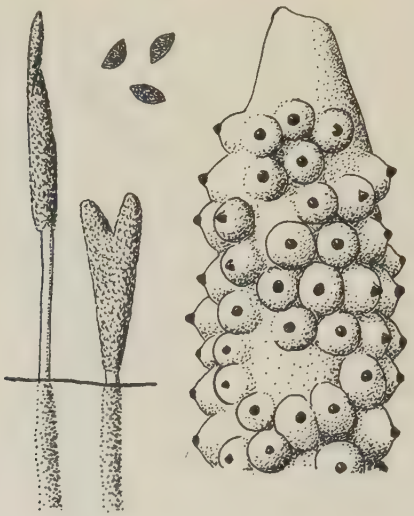

Fig. 6. *Xylaria brasiliensis* (Theiss.) Lloyd. Stromata natural size and the tip of one enlarged, ascospores × 660, from the Lloyd herbarium numbers 10135 and 12210.

Xylaria brasiliensis (*Theiss.*) *Lloyd* in Mycological Notes 6, 893 (Oct. 1919).

Xylaria arenicola Welw. & Curr. var. *brasiliensis* Theiss. in Ann. Mycol. **6,** 343 (1908).

Xylaria scotica Cooke var. *brasiliensis* (Theiss.) Theiss. Xylariaceae austrobrasilienses 1, 5 (1909).

Stroma simple or occasionally branched, arising from a cylindrical rooting base, stalk above ground usually short, smooth or longitudinally furrowed, dark purplish brown, fertile portion subcylindrical and simple or forked or lobed and then often much flattened, up to 3·5 cm. long,

apex rounded and fertile or with a short, sterile, grey tip ; perithecia more or less crowded, more or less mammiform, about 300μ diameter, blackish-brown, often with a paler zone around the ostiolar papilla, the latter conical, black and shining ; flesh whitish, becoming hollow. Ascospores dark brown, translucent, 6–8 × 3–4μ, up to 10 × 5μ according to Theissen. Fig. 6.

In grassy places where there are indications of old termite nests, according to Rick, quoted by Lloyd.

I have only seen the material from Rick in the Lloyd herbarium but there can be no doubt Bresadola and Lloyd were correct in stating the species to be quite distinct from the allied *X. nigripes* (Klotzsch) Sacc., the common *Xylaria* of termite nests in tropical Africa and Asia. It has obvious affinities, however, with *X. rhizomorpha*, as already indicated by Theissen, and apparently also with *X. rhizocola*, which differs in its slightly larger ascospores and less conical ostiolar papilla. It is not known whether *X. brasiliensis* has an underground sclerotium like that of *X. nigripes*.

X. micrura Speg. 1899 may be an older name for *X. brasiliensis* but the single stroma of the former preserved in the Spegazzini herbarium at La Plata leaves the synonymy open to question. It has the small ascospores, 7–9 × 3–4·5μ and long rooting base but the perithecia are more completely immersed and the surface of the stroma is pale ochraceous. It would be well to see a wider range of collections from the type locality, La Plata, before concluding these two species to be identical. Spegazzini (1921) ultimately concluded that his *X. micrura* was cultivated in nests of *Acromyrmex Lundi*, a leaf-cutting ant, not a termite.

Xylaria rhizocola (*Mont.*) *Fr.* in Nov. Act. Reg. Soc. Sci. Upsal. Ser. 3, **1,** 127 (1851).

Hypoxylon rhizocola Mont. in Ann. Sci. Nat. Bot. Ser. 2, **13,** 344 (1840).

Stroma simple or forked, slender, more or less cylindrical, up to 10 cm. high, stalk long, 2 mm. thick, surface dark brown, covered with closely matted hyphae ; fertile apical portion cylindric-clavate, up to about 2 cm. long and 3 mm. thick, rounded at the tip, completely covered with strongly mammiform, nearly black perithecia, with smooth crust and discoid nonpapillate ostioles. Ascospores very dark brown but not opaque, 10–12 × 4–4·5μ. The base of the stalk is rooting, arising from radiating mycelial strands, and was said to be attached to a buried root. Fig. 7.

French Guiana : in forests beside the river Inipi, April 1836, Leprieur 235, typus in Herb. Paris.

Theissen (1909), who recognised this species in south Brasil, stated it to arise from deeply buried fruits and thought its affinities lay with *X. palmicola*, see group 6. He recorded ascospores 12–17 × 5–7μ and it is not quite certain that he referred to the same species as Montagne.

Group 4. Perithecia not in rows on an axis but partially embedded in a stroma with their upper portions protruding to give a mammiform surface ; stromata not terrestrial. This is one of the least homogeneous groupings.

Xylaria luxurians (*Rehm*) *Lloyd* in Mycological Notes 5 ; Xylaria Notes p. 29 (Dec. 1918).

Xylaria carpophila Fr. var. *luxurians* Rehm in Hedwigia **40,** 147 (1901).

Fertile portion of the stroma cylindrical or ovate, up to 6 × 2 mm., apex rounded or shortly pointed, seated on a long, slender, strap-like, downy stalk up to 7 cm. long, which may be simple or once or twice branched ; perithecia mammiform to almost free, surface minutely rugulose, black, with prominent ostiolar papillae. Ascospores 21–24 × 8–9μ. Fig. 8.

On fallen petioles and on dead wood.

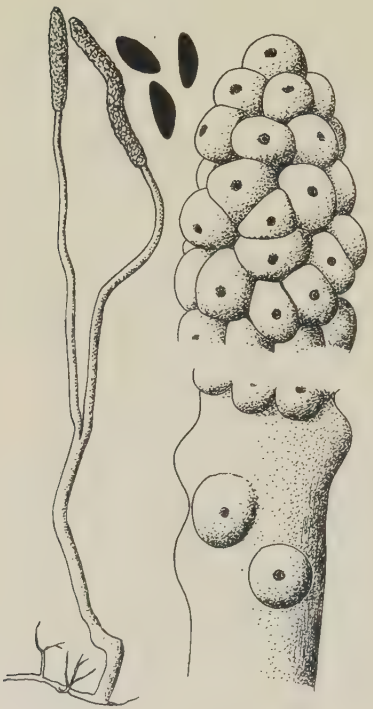

Fig. 7. *Xylaria rhizocola* (Mont.) Fr. Stromata natural size, on right tip and base of the fertile portion enlarged, ascospores × 660, from Leprieur 235.

Fig. 8. *Xylaria luxurians* (Rehm) Lloyd. Stromata natural size and enlarged, ascospores × 660, from Ule 786.

Brasil : Blumenau, Sta. Catharina, July 1888, Ule, Herbarium Brasiliense 786 (Type number).

Trinidad : on dead wood, Heights of Aripo, D. H. Maggs, 11.6.1945, L.C.T.A. 569.

Also reported by Miller (1934) from Venezuela and possibly represented by Bertero 1723, on bark of *Urtica excelsa* from Juan Fernandez, in Herb. Kew. as *X. hypoxylon* var. *uniformis* Mont. It seems likely that *X. theissenii* Lloyd in Myc. Notes 5, p. 677, Feb. 1917 and *X. lancea* Lloyd Dec. 1919 are the related species but I have seen no specimen

authentic for the former name and only a single poorly developed stroma of the latter. Hence the clearly typified name *X. luxurians* is adopted for the present. The species shows affinities with those of group 2.

Xylaria appendiculata *Ferd. & Winge* in Bot. Tidssk. **29,** 17 (1908).

Stroma slender, cylindrical, 2–6 mm. long and up to 1 mm. wide, without a conidial tip, black, surface minutely downy, somewhat mammiform with the protruding perithecia, ostiolar papillae prominent, convex to conical ; stalk slender, black, covered with erect downy hairs. Ascospores 12–15 × 7–8μ, with a hyaline rounded appendage up to 4μ long at each end. Fig. 9.

On fallen leaves.

Panama Canal Zone : Fort Sherman area, 5.8.1945, G. W. Martin 6154.

I have been unable to trace the type collection, on leaves of *Crescentia*, Caledonia Valley, St. Croix, Virgin Is., 2.2.1906, Raunkiaer 1780.

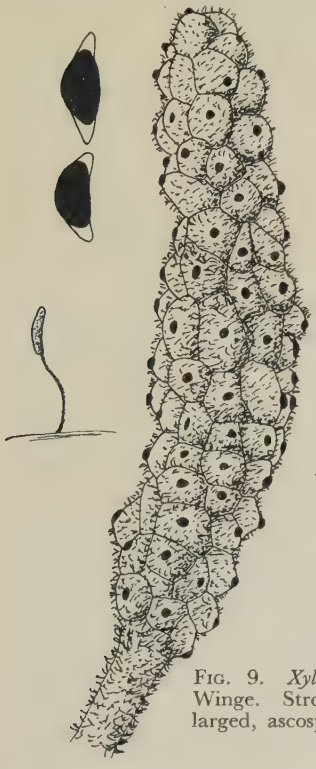

FIG. 9. *Xylaria appendiculata* Ferd. & Winge. Stroma natural size and enlarged, ascospores × 660, from Martin 6154.

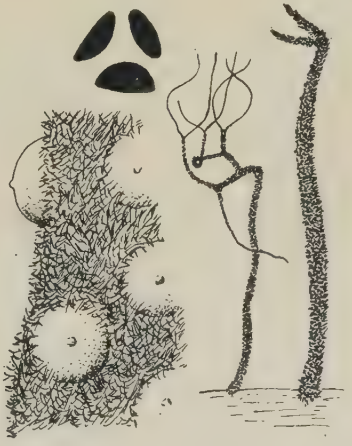

FIG. 10. *Xylaria ianthino-velutina* (Mont.) Fr. Stromata natural size, a few perithecia enlarged, ascospores × 660.

Xylaria ianthino-velutina (*Mont.*) *Fr.* in Nov. Act. Reg. Soc. Sci. Upsal. Ser. 3, **1,** 128 (1851).

Hypoxylon xanthino-velutinum Mont. in Ann. Sci. Nat. Bot. Ser. 2, **13,** p. 348, 1840.

Stroma strap-shaped, simple or repeatedly forked, up to 5 mm. wide and about 12 cm. long, the tips tapering and pointed and often bearing conidia, the remainder densely clothed throughout with velvety dark-

brown hairs, often with a slight purplish tint, especially on the sterile base ; perithecia scattered over the upper parts of the stroma, mammiform, with a smooth black surface and minute ostiolar papilla. Ascospores 10–13 × 4–6μ. Fig. 10.

Stromata are usually found on fallen fruits. Tropical American collections at Kew include the following :

French Guiana : Leprieur 574, authentic material, from Montagne in Herb. Berk.

Surinam : unlocalised collection labelled *Sphaeria multiplex* Kze. n. sp. by Klotzsch and at first regarded as authentic for that species by Lloyd.

Brasil : on legumes, Obydos, 18.2.1874, Trail 136 ; in leguminibus putridos, 1901 and 1902 Jurua et Marmellos, Amazonas, Ule, Appendix Mycothecae brasilienses 28 ; on fruit of Apeiba (Tiliaceae), Obydos, Trail 156 ; auf Fruchten von Couroupita (Lecythidaceae), Jurua, Boccado Tejo, Amazonas, Mai 1901, Ule, Herb. brasiliense 2859 as *Xylaria luzonensis* forma *lecythae* ; in fructibus palmae, Sao Leopoldo, Sta. Catharina, leg. Theissen ; Maromba, P.N. Itatiaya, Est. do Rio de Janeiro, 1100 m. leg. O. and K. Fidalgo, 10.9.1955 ; on legume, Paineiras, Rio de Janeiro, D.F., leg. Schwacke 5623, 29.6.1887.

Paraguay : croissant sur les fruits du Curupai tombés à terre, Mars 1880, Balansa, Pl. du Paraguay 3414, the host is *Anadenanthera* cf. *colubrina* (Vell.) Brenan fide N. Y. Sandwith.

Argentina : on fruits of *Piptadenia macrocarpa*, Tucuman, April 1906, leg. C. Spegazzini 3231, ascospores only 9–10 × 3·5–4·5μ.

Trinidad : on pods of a leguminous tree, Botanic Garden, Port of Spain, R. Thaxter.

Mexico : on pods of a leguminosa, Cordova, Nov. 1854, Sallé 92 ; on pieces of the fruit of a tree called Yolusuche, Mt. of Mattaquihahuilte, Cordova, Dec. 1854, Sallé 104, probably Yolosuchil, *Talauma mexicana* (Magnoliaceae) is meant according to Mr. Sandwith.

Colombia : Mitu, 3.11.1952, Anglo-Colombian Cacao Exped. P.H. 94, on fallen pods.

The eastern tropical form of this widespread species has been called *Xylaria culleniae* Berk. & Br. but it differs from the American form only in its slightly smaller ascospores, 8–10 × 4–4·5μ. It is generally assumed that *Xylaria luzonensis* P. Henn. is a synonym of *X. culleniae*. Montagne first published the name as " *xanthino-velutinum* ", evidently by a typographical error as there is nothing yellow about the hairs and the spelling was corrected to " *Ianthino-velutina* " in his subsequent publications.

Xylaria dichotoma (*Mont.*) *Fr.* in Nov. Act. Reg. Soc. Sci. Upsal. Ser. 3, **1,** 127 (1851).

Hypoxylon dichotomum Mont. apud Ramon de la Sagra, Flora Cubana 1, p. 214, 1845.

This apparently is to *X. ianthino-velutina* as *X. microceras* is to *X. coccophora*, differing mainly in its smaller perithecia with ascospores 9·5–12 × 3–4μ and in growing on rotten wood rather than on fruits. Fig. 11 is from authentic material sent by Montagne to Berkeley :

Cuba : ad ligna dejecta prope Alquizar, 100 m. alt.

Xylaria myosurus *Mont.* in Ann. Sci. Nat. Bot. Ser. 4, **3,** 110 (1855).

Stromata clustered, up to 20 × 2 mm., with ill defined smooth stalks and tapering pointed tips, black ; perithecia completely immersed apart from their conical ostiolar papillae. Ascospores 7–10 × 3–4μ. Fig. 12.

On dead wood.

This is another imperfectly known species, of which I have seen only part of the type collection from French Guiana, Leprieur 1412. Judging by his meagre description and figure, however, the sterile fungus Lloyd called *X. muscula* may belong here rather than to *X. microceras* as he suggested.

Fig. 11. *Xylaria dichotoma* (Mont.) Fr. Stromata natural size and a portion enlarged, ascospores × 660.

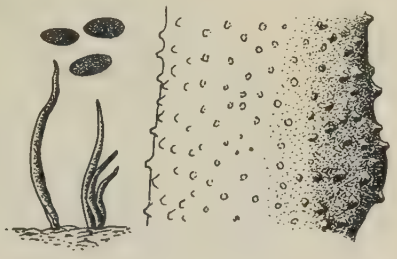

Fig. 12. *Xylaria myosurus* Mont. Stromata natural size and a portion enlarged, ascospores × 660.

Xylaria phosphorea *Berk.* in J. Linn. Soc. Bot. **13,** 177 (1872).

Xylaria rhizophila Cooke & Massee in Grevillea **22,** 37 (Dec. 1893).

Xylaria riograndensis Theissen in Ann. mycol. **6,** 343 (1908).

Perithecial stromata usually small, up to 1·5 cm. long and 2 mm. thick, with short smooth stalk and pointed apex ; surface orange-brown throughout, perithecia maturing first in the central portion of the stroma but ultimately developed to the tip, crowded, immersed but strongly mammiform, smooth, with large, conical, black ostiolar papillae ; flesh white, solid. Ascospores brown, translucent, 10–15 × 4–5μ. Fig. 13.

On dead wood.

The type collection of *X. phosphorea* is from Australia and the only tropical American material seen is :

Brasil : Petropolis, Rio Grande do Sul, January 1907, leg. J. Rick, part of the type collection of *X. riograndensis* in Herb. Sydow, Stockholm. A second collection, September 1908, includes conidial stromata up to 5 cm. tall, cylindrical, bearing perithecial rudiments along their middle.

The material of *X. rhizophila*, from Brisbane, Australia, includes perithecial stromata with obtusely lobed tips. Ascospore size is very uniform in all the above collections and the large conical ostiolar papillae are highly distinctive.

Xylaria fulvella Berk. & Curt. in J. Linn. Soc. Bot. **10,** 380 (1869).

Stroma simple, small, narrowly clavate, with a well-defined longitudinally wrinkled stalk covered with a thin web of orange-buff hyphae, perithecia crowded, mammiform, surface smooth, orange-buff, ostiolar papillae black, convex ; flesh white, solid. Ascospores elliptical, dark-brown, 7–9 × 4–4·5μ. Fig. 14.

On dead wood, Alabama, Peters 4902.

Unless it can be dismissed as a small-spored state of the preceding this curious little fungus is known only from the type collection, dubiously supplemented by Wright 590, from Cuba, which Berkeley guessed might be very immature and sterile material of the same species.

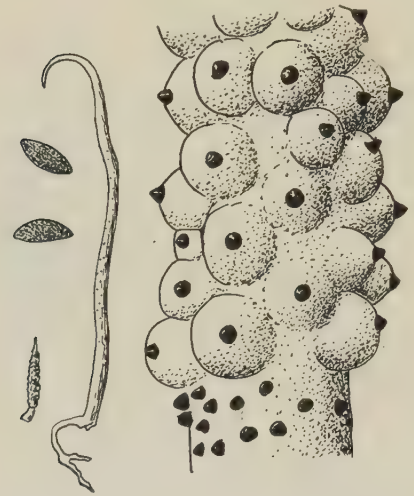

Fig. 13. *Xylaria phosphorea* Berk. Stromata natural size and the base of the fertile portion of one enlarged, ascospores × 660, from authentic material of *X. riograndensis*.

Fig. 14. *Xylaria fulvella* Berk. & Curt. Stroma natural size and a portion enlarged, ascospores × 660, from Peters 4902.

Xylaria digitata (*L. ex Fr.*) *Grev.*, Flora edinensis, 55 (1824).

Sphaeria digitata L. ex Fr., Syst. Myc. **2,** 326 (1823).

Stroma branched, typically with a massive obconical base from which arise several fusiform-clavate fertile branches ; perithecia crowded, semi-immersed, somewhat mammiform, surface smooth, black, with small, convex, ostiolar papillae ; flesh solid, white. Ascospores often reniform, dark grey-brown, 15–20 (–21) × 5–7μ. Fig. 15.

Usually arising from buried wood or at soil level from posts.

Xylaria digitata has repeatedly been reported from the West Indian region and there is no obvious reason why it should not occur there but all the material from tropical America so called at Kew is either sterile or misdetermined. Hence the description is based on European material, including a specimen at Kew so named by Persoon, Klotzsch Herb. Myc. Ed. Nov. 46 and old British collections. These are very uniform, both in gross morphology and in ascospore size, and evidently represent a good species. The North American *Xylaria cornu-damae* (Schwein.) Fr. is very similar and may even be synonymous.

Xylaria platypoda (*Lév.*) *Fr.* in Nov. Act. Reg. Soc. Sci. Upsal. Ser. 3, **1,** 127 (1851).

Sphaeria platypoda Lév. in Ann. Sci. Nat. Bot. Ser. 3, **3,** 40 (1845).

Xylaria elegans Syd. in Ann. Mycol. 5, 357 (1907).

Stroma simple, clavate, with a pointed tip, up to 3 cm. tall, surface of the fertile portion slightly mammillate with the protruding perithecia, very minutely rugose and covered with a whitish pruina, ostiolar papillae small, black, only slightly convex ; stalk short or as long as the fertile portion, enlarged upwards or cylindrical, black, smooth, with a discoid base. Ascospores fusiform, pointed at each end, 36–50 × 12–15μ. Fig. 16.

On wood.

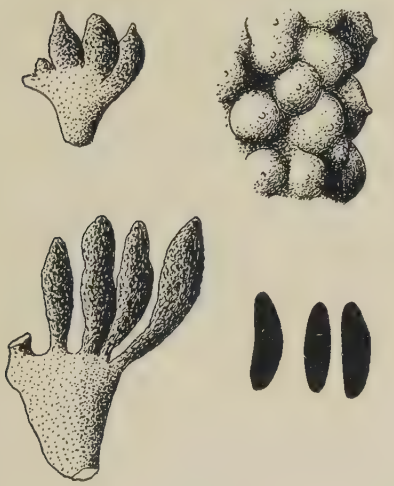

Fig. 15. *Xylaria digitata* (L. ex Fr.) Grev. Stromata natural size, the upper from a collection named by Persoon, the lower from Klotzsch Ed. Nov. 46, a few perithecia enlarged, ascospores × 660.

Fig. 16. *Xylaria platypoda* (Lév.) Fr. Stroma natural size and perithecia enlarged, ascospores × 660, from Goudot's collection.

Colombia : Cordillera Central, Pic de Tolima, Cuchilla de la divisadera, leg. Goudot, type collection of *X. platypoda.*

Brasil : Sao Francisco dos Campos, Sao Paulo, 30.12.1898, Noack 793a, part of the type collection of *X. elegans* in Herb. Bresadola, Stockholm.

Material named *X. platypoda* from French Guiana by Montagne is " *X. rhopaloides* ", Montagne was evidently misled by the white crust so conspicuous in that state of *X. curta.*

Group 5. Stroma with a much branched conidial tip, a swollen perithecial zone with white surface which flakes away to expose a black downy crust, and a slender shaggy stalk.

Xylaria comosa (*Mont.*) *Fr.*, Summa Veg. Scand. Sect. Post. 381 (1849).

Hypoxylon comosum Mont. in Ann. Sci. Nat. Bot. Ser. 2, **13,** 345 (1840).

Hypoxylon collabens Mont. op. cit. 1840.

Xylaria collabens (Mont.) Fr., op. cit. 1849.

Xylaria tigrina Speg. in Bol. Acad. Nac. Cienias Cordoba 11, Fungi Puiggariani, 138 (1889).

? *Xylaria tuberculosa* Lloyd in Mycological Notes, **5,** 769 (June 1918).

Fertile stroma globose to shortly cylindrical, up to about 1·5 cm. long and 1 cm. thick, crust smooth, at first covered with a white coating which fragments to expose a purplish-black, minutely velvety surface and then often for a while pitted with closely spaced small whitish spots, ostioles punctate, flesh hollow ; stalk long and slender, simple or rarely forked, black, covered with erect, velvety or shaggy, black hairs. The apex of the fertile stroma bears from one to several short, slender, pointed processes and similar processes may arise in a ring round its base. Ascospores (21)–26–40 × 7–11 μ, narrowed and somewhat pointed with traces of a hyaline rounded appendage at each end. Fig. 17.

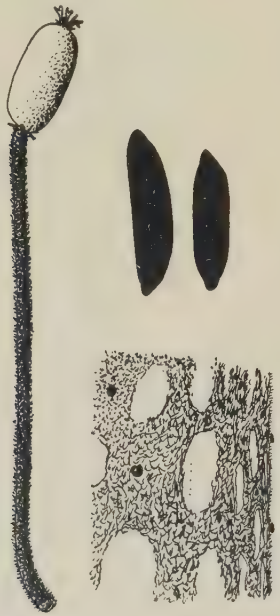

Fig. 17. *Xylaria comosa* (Mont.) Fr. Stroma natural size and a small portion enlarged, ascospores × 660.

French Guiana : in sylvis Guianae centralis ad ripas amnis Camopi, in cortice arborum emortuorum putridorumque, Leprieur 407 & 409, type collection of *X. collabens*, fragment from Montagne at Kew ; ad lignum emortuum in sylvis Sinamariensibus, Jan. 1839, Leprieur 418, type collection of *X. comosa*, portion from Montagne at Kew.

Surinam : leg. Hostmann, sterile.

Brasil : Apiahy, leg. Puiggari, April 1888, typus of *X. tigrina* in Herb. Spegazzini.

Trinidad : Quare Valley, 23.9.1945, D. H. Maggs, I.C.T.A. 734.

Cuba : Wright 311, the remaining numbers cited by Berkeley & Curtis are somewhat doubtful, as is also material so named from San Domingo.

Montagne himself thought *H. comosum* and *H. collabens* were probably based on different states of a single species. The type collection of the former was sterile whereas that of the latter has ripe ascospores, nevertheless the name *X. comosa* has been generally adopted for the species.

Theissen (1908) agreed that the names *X. comosa* and *X. collabens* applied to the initial and final developmental stages of the stroma in a single species and added that the names *X. tigrina* Speg. and *X. barbata* Starb. applied to intermediate stages of development, when the white superficial layer was peeling away from the underlying black crust. The name *X. romuligera* Starb. has been applied to the conidial state.

Group 6. Stromata slender, usually with pointed tips, covered with a thin fibrous layer which splits longitudinally to expose the ostiolar papillae.

Xylaria microceras (*Mont.*) *Fr.* in Nov. Act. Reg. Soc. Sci. Upsal. Ser. 3, **1,** 128 (1851).

Hypoxylon microceras Mont. in Ann. Sci. Nat. Bot. Ser. 2, **13,** 348 (1840).

Stroma narrowly cylindrical, up to 20 × 2 mm., apex rounded or pointed, surface at first covered with a white layer which splits to reveal the smooth, black, slightly mammiform perithecia, with minute ostiolar papillae ; stalk short, smooth, with a slightly discoid base. Ascospores 9–12 × 3–5μ. Fig. 18.

On rotten wood.

Fig. 18. *Xylaria microceras* (Mont.) Fr. Stromata natural size and portions enlarged, apex from Wright 209, lower portion from Leprieur 242, ascospores × 660.

French Guiana : in sylvis montosis Kau et Sinamariensibus 1838 et 1839, Lepieur 242, authentic material from Montagne at Kew.

Cuba : Wright 209.

All the material at Kew determined as *X. microceras* is unbranched but the possibility of branching is admitted in the diagnosis, " simplex, raro furcatum ". Very similar but often forked stromata were called by Montagne *X. coccophora.* These are treated here as representing a distinct species because their perithecia are considerably larger than those of the type of *X. microceras.*

Xylaria coccophora *Mont.* in Ann. Sci. Nat. Bot. Ser. 4, **3,** 109 (1855).

Xylaria variegata Syd. in Ann. Mycol. **5,** 358 (1907).

Xylaria compressa Pat. & Gaill. in Bul. Soc. Mycol. France **4,** 108 (1888).

Fig. 19. *Xylaria coccophora* Mont. Stromata natural size and portions enlarged, ascospores × 660, upper figures from Leprieur 1398, lower from type collection of *X. variegata* Syd.

Stroma simple or once or twice forked, up to 4 cm. tall, narrow and strap-like below, with a smooth stalk and smooth discoid base, becoming slenderly cylindrical above, with sharply pointed tip ; perithecia mammiform, covering the axis in the upper portion but often arranged in a single series along one edge towards the base, their surface covered with a thin buff layer with sulphur coloured basal stratum, which splits to reveal the

almost smooth black perithecia ; ostioles punctate, not papillate. Ascospores almost black and opaque, 8–10 × 3·5–5μ. Fig. 19.

On dead wood.

French Guiana : Leprieur 1398, type collection of *X. coccophora.*

Venezuela : Atures, July 1887, Gaillard 102, typus of *X. compressa.*

Trinidad : Quare valley, 23.9.1945, D. H. Maggs, I.C.T.A. 732.

Paraguay : sur le bois mort, Guarapi, Juin 1883, Balansa 3904 ; Mars 1883, Balansa 3774, both issued as *X. digitata* var. *torulosa.*

Brasil : Campinas, Sao Paulo, January 1897, type collection of *X. variegata* in Herb. Sydow and Herb. Bresadola at Stockholm. This has slightly smaller ascospores, 7–9 × 2·5–3μ and more prominent ostiolar papillae than the type of *X. coccophora* but it is very doubtful if it can be recognised as a distinct species.

Xylaria nodulosa *Lloyd* in Mycological Notes **6,** 1007 (Sept. 1920).

Stroma strap-like, repeatedly forked, especially in the upper part, up to 17 cm. long and from 2 to 4 mm. wide, tips pointed, surface smooth, whitish ; perithecia erumpent, becoming almost free, scattered on the branches or crowded towards their tips, black, their ostiolar papillae strongly developed, subconical. Ascospores 32–38 × 8–9μ. This is said to be a terrestrial species but perhaps arose from buried wood.

Brasil : Sta. Catharina, leg. J. Rick, typus in Herb. Lloyd.

Xylaria multiplex (*Kze.*) *Fr.* in Nov. Act. Reg. Soc. Sci. Upsal. Ser. 3' **1,** 127 (1851).

Sphaeria multiplex Kunze apud Fr. in Linnaea **5,** p. 536, 1830.

Xylaria caespitulosa Ces. Mycetum in itinere borneensi p. 15, 1879.

Stromata densely caespitose, slender, up to about 4 cm. long and about 2·5 mm. wide, usually pointed at the tips, tapering below to a narrow, strap-like, finely tomentose stalk, which is often once or twice forked, stromata sometimes distinctly nodulose with the perithecia and somewhat resembling siliquae ; crust smooth, black, finely split by longitudinal anastomosing cracks, at first covered by a thin, paler, matt, surface layer which splits into narrow subpersistent strips, ostioles punctate, scarcely papillate. Ascospores 9–12 × 4–4·5μ. Fig. 20.

On wood.

Colombia : confluence of Rio Caguan and R. Guaya, 20.4.1953, Anglo-Colombian Cacao Exped. P.H. 309.

Venezuela : Aragua, hillside road from Maracay to Ocumare, 25.7. 1932, Chardon 669 ; Tachira, coffee plantations near San Cristobal, 19.9.1932, Chardon 1269.

Trinidad : Emperor valley, Port of Spain, R. Thaxter, det J. H. Miller 8874 ; St. Anne's valley, Port of Spain, R. Thaxter, det. J. H. Miller 8877 ; bamboo plantation, St. Joseph, 10.10.1947, R. E. D. Baker, I.C.T.A. 1717.

Grenada : on stump, Burnside estate, 20.10.1948, W. T. Dale, I.C.T.A. 1943.

Cuba : Wright 290, as *X. scopaeformis*.

French Guiana : Cayenne, Leprieur 228, as *Hypoxylon scopiforme*, sterile.

Brasil : Jardim Botanico do Rio de Janeiro, leg. C. and K. Fidalgo, 11.7.1955.

Xylaria multiplex is here understood in the second interpretation published by Lloyd, who in his early papers applied the name to what is here called *X. ianthino-velutina*. Very slender stromata growing in dense clusters, are conveniently distinguished as " *X. scopiformis* Kunze in Weigelt exsic. " or " Kunze ex Berk. & Curt., 1853 ", a name which came into general use in herbaria without being validly published ; " Diagnosis reperire non potui " says Saccardo in Sylloge fungorum 1, p. 340, 1882. The two states appear to me grade into one another and much of the material labelled *X. scopiformis* is immature and quite sterile.

Fig. 20. *Xylaria multiplex* (Kze.) Fr. Stromata natural size and tip of one enlarged, ascospores × 660.

The typus of *Sphaeria tenuis* Pers., from Rio de Janeiro, may well be interpreted as very young material of this kind ; so probably is that of *X. gracilis* Klotzsch, from the Andes, leg. Humboldt. On the other hand stout forms of *H. multiplex* appear to grade into the temperate *X. hypoxylon*, especially at high altitudes in the tropics. Typical *X. hypoxylon* (Fr.) Grev. reappears in temperate South America, where Spegazzini collected it on *Salix* and redescribed it under the names *X. cristata* Speg. and *X. fasciculata* Speg.

Xylaria stromatica Lloyd is probably to be interpreted as a stunted condition of *X. multiplex* growing on a herbaceous stem.

Xylaria multiplex (*Kze.*) *Fr.* var. **microsperma** (*Speg.*) *Dennis*, comb. nov.

Xylaria biceps Speg. var. *microsperma* Speg. in An. Soc. Cient. Argentina **18,** 277 (1884).

Stromata simple or branched, more or less flattened, about 4 mm. wide, apices rounded, surface smooth, splitting longitudinally, black,

outline somewhat nodulose with perithecial swellings, ostioles punctate ; stalk slender and strap-like or ill-defined, smooth or slightly tomentose towards the base. Ascospores 6–9 × 3–4μ. Fig. 21.

Paraguay : sur les troncs pourris, Guarapi, 19.7.1881, Balansa 2772, type number.

British Guiana : on dead log, Moraballi Creek, near Bartica, Essequibo river, E. B. Martyn 660, 23.10.1929.

Jamaica : Newhaven Gap, Blue Mts., May 1945, mixed with *X. multiplex*.

The variety is rather doubtfully distinct from var. *multiplex* ; Spegazzini named it in comparison with *X. arbuscula*, which has distinctly larger spores.

Fig. 21. *Xylaria multiplex* var. *microsperma*. Stromata natural size and tip of one enlarged, ascospores × 660, from Martyn 660.

Fig. 22. *Xylaria fustis* Mont. Two stromata natural size and the fertile portion of one × 7, ascospores × 660, from the type collection.

Xylaria inaequalis *Berk. & Curt.* in J. Linn. Soc. Bot. **10,** 382 (1869).

Xylaria fustis Mont. apud Cooke in Grevillea **11,** 87 (1883).

Axis slender, up to 3 cm. long, scarcely 0·5 mm. wide, strap-like and often twisted when dry, sometimes forked, black, smooth above, shaggy-tomentose below, with a densely tomentose swollen base. Perithecia arranged in more or less distinct rows along one or both sides of the axis in its upper part, hemispherical and scattered or becoming confluent, black, with minute, slightly papillate, ostioles, the crust smooth or cracking slightly in a longitudinal direction. Ascospores 9·5-12 × 4–6μ. Fig. 22.

On dead wood.

Cuba : Wright 605, typus of *X. inaequalis* ; on trunks, without further data, typus of *X. fustis*.

Venezuela : Yaracuy, forest north of San Pablo, 27.9.1932, Chardon 1325.

The type material of *X. inaequalis* is in very bad condition and both the interpretation of the name and the status of the species may be subject to revision when more numerous collections are available.

Xylaria arbuscula *Sacc.* in Michelia **1,** 249 (1878).

Xylaria biceps Speg. in An. Soc. Cient. Argentina **12,** 110 (1881).

Xylaria biceps Speg. var. *botryosa* Rehm in Hedwigia **28,** 300 (1889).

Xylaria mellisii Cooke in Grevillea **11,** 85 (1883).

Xylaria botrys Pat. in Journal de Botanique **4,** 63 (1890).

Xylaria pattersonii Massee in Kew Bull., 2 (1910).

Fig. 23. *Xylaria arbuscula* Sacc. Stromata natural size and apex enlarged, ascospores × 660.

Fertile portion of the stroma usually less than 1 cm. long, about 2 mm. wide, somewhat flattened, usually with a short pointed tip, less often obtusely rounded or even vaguely lobed, apex usually light grey with remnants of the superficial layer which elsewhere splits into strips and flakes off, exposing the dark brown to black crust ; perithecia not protruding, ostiolar papillae small, subconical ; stalk sharply defined, slender, strap-like, often twisted, minutely tomentose, simple or branched, sometimes repeatedly so with the fertile portions of the stroma forming a dense cluster on a common stalk. Ascospores 11–15 × 4·5–6μ. Fig. 23.

The type collection of *X. arbuscula* was from a glasshouse in Italy, tropical American material seen includes the following :

Argentina : Buenos Aires, typus of *X. biceps*, in Herb. Spegazzini ; Cordoba, Alta Gracia, 20.1.1925, leg. C. Bruch.

Brasil : on trunk of an old tree, Arroyos, April 1841, Gardner s.n., as *X. hypoxylon* var. *mucronatum* ; Glaziou 8532, unlocalised.

Venezuela : Aragua, La Cumbre, road from Maracay to Ocumare, 1350 m., 17.6.1932, Chardon 1380.

Trinidad : H. Caracciolo, 1910.

St. Vincent : unlocalised collection, probably from Rev. L. Guilding, about 1830, labelled " *X. hypoxylon* var. *acuminata* Klotzsch " ; type collection of *X. pattersonii*, unlocalised.

Bermuda : on wood, Smith Parish, 17.9.1915, Fungi of Bermuda 462.

Lloyd, in Mycological Notes **5,** p. 676, suggested *X. trachelina* Lév. might be an earlier name for this very common species but the type collection has ascospores 19–22 × 6–8μ and is *X. scruposa* sensu Montagne.

Xylaria apiculata *Cooke* in Grevillia **8,** 66 (December 1879).

Xylaria venosula Speg. in Bol. Acad. Nac. Cienc. Cordoba **11,** Fungi Puiggariani, 133 (1889).

Xylaria cookei Lloyd in Mycological Notes **5,** Large Pyrenomycetes, 25 (July 1919).

This species is externally like *X. arbuscula* but is easily distinguished by its larger ascospores, 16–21 × 6–7·5μ and often more elongated stromata.

Fig. 24. The stunted " *Hypoxylon xylaroides* " state of *Xylaria apiculata* Cooke, stromata and section × 12, ascospores × 660, all from the type collection of *H. xylaroides*, La Recoleta, Rio de la Plata, March 1880, in Herb. Spegazzini.

Brasil : Sao Leopoldo, leg. Theissen ; Apiahy, leg. Puiggari, typus of *X. venosula* in Herb. Spegazzini ; Mauá, Serra do Itatiaya, Est. do Rio de Janeiro, leg. M. C. Vaughan Bandeira, 7.3.1925.

Trinidad : Aripo caves, February 1945, I.C.T.A. 451.

The type collection of *X. apiculata* came from New Zealand. The names *Hypoxylon xylaroides* Speg. and *Xylaria Schreuderiana* van der Byl have been applied to the stunted Kretzschmarioid state of this species. Fig. 24.

Xylaria phyllocharis *Mont.* in Ann. Sci. Nat. Bot. Ser. 4, **3,** 108 (1855).

Stromata scattered, simple, slender, cylindrical, up to 45 mm. long and 0·75 mm. thick, with pointed sterile tip and long smooth stalk ; fertile portion up to 27 mm. long, outline even or slightly undulating, crust thin, purplish brown, smooth and free from cracks but striate with remnants of a cinereous pruinose coating ; perithecia minute, rather sparsely distributed, completely immersed, ostiolar papillae minute, black, slightly

convex ; flesh whitish, solid. Ascospores blackish, opaque, 12–13 × 6–7·5μ. Fig. 25.

On fallen leaves, probably of *Strychnos*, fide N. Y. Sandwith.

French Guiana : Cayenne, Leprieur 1208, typus in Herb. Paris.

Trail 159, from the Amazon, is immature but surely this species rather than *X. filiformis* as published by Berkeley and Cooke (1876).

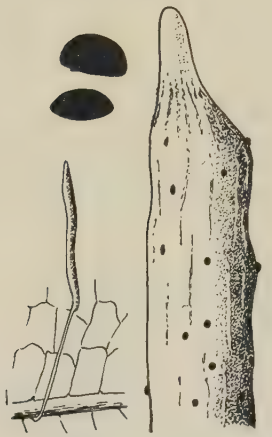

FIG. 25. *Xylaria phyllocharis* Mont. Stroma natural size and tip enlarged, ascospores × 660, from Leprieur 1208.

FIG. 26. *Xylaria palmicola* Wint. Stroma natural size and small portion enlarged, ascospores × 660, from type collection of *X. bruneriana* Seaver.

Xylaria palmicola *Winter* in Grevillea **15,** 89 (March 1887).

Xylaria bruneriana Seaver in Bull. Torrey Bot. Club **50,** 309 (1923).

Stroma simple, slender, cylindrical, up to 14 cm. long and 4 mm. thick, apex pointed, perithecia rather prominent, surface smooth, brown, splitting longitudinally along numerous, closely spaced, more or less parallel cracks, ostioles minute, not papillate ; stalk well defined, very long, brown, smooth but becoming longitudinally wrinkled and somewhat twisted when dried. Ascospores 13–16 × 6–7μ, with pointed ends. Fig. 26.

On fallen and decaying seeds of palms.

Puerto Rico : on seeds of *Euterpe globosa*, El Yunque, 24.2.1923, typus of *X. bruneriana*.

X. palmicola was described from fallen fruits of an unnamed palm at Sao Francisco, Sta. Catharina, Brasil and Seaver thought it best to

describe his collection as a distinct species because the Puerto Rican host does not occur in south Brasil. Species of *Xylaria* are not usually narrowly host-limited, however, and as the descriptions of the two species agree well Miller was no doubt justified in concluding them to be the same and in so annotating the typus of *X. bruneriana* at New York. *X. palmicola* is evidently closely akin to *X. hypoxylon* but seems sufficiently distinguished by its stature, colour and slightly larger ascospores.

Xylaria rickii *Theissen* in Ann. mycol. **6,** 342 (1908).

Stromata scattered, up to 7 cm. long and 4 mm. wide, simple, cylindrical to compressed, with well developed smooth stalks and tapering tips ; surface smooth, finely longitudinally striate, wrinkled around individual perithecia or groups of perithecia, which are otherwise completely immersed in the stroma, dark purplish-brown to almost black ; ostiolar papillae black, shining, discoid, only very slightly convex.

Ascospores inaequilateral to reniform, grey-brown, 18–25 × 5–7μ, with a very short germ slit, only 4–5μ long. Fig. 27.

On dead wood.

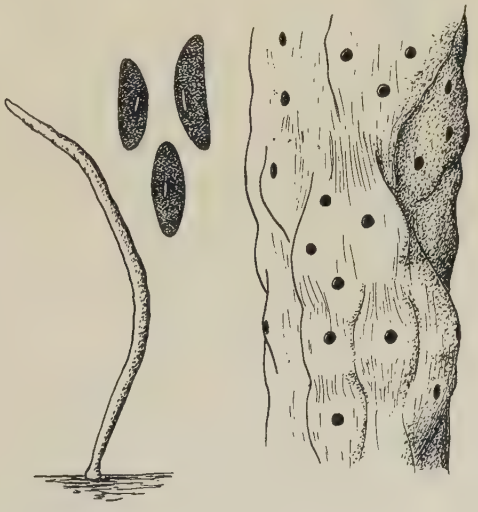

Fig. 27. *Xylaria rickii* Theiss. Stroma natural size and small portion enlarged, ascospores × 660, from Herb. Bresadola.

Brasil : Sao Leopoldo, Rio Grande do Sul, leg. J. Rick, authentic material in Herb. Bresadola, Stockholm.

A note on the packet indicates larger ascospores, 25–32 × 6–8μ but this may be an error, the published diagnosis cites spores 20–28 × 6–7μ.

Group 7. Species with a smooth hard crust and completely immersed perithecia but with stromata tapering to a point, or with flattened strap-like stalks if the tip is obtuse.

Xylaria pallida *Berk. & Cooke* in J. Linn. Soc. Bot. **15,** 395 (1876).

Stromata narrowly cylindrical, up to 3 cm. long and 2·5 mm. wide, apex broadly rounded or with a short distinct point, stalk slender, somewhat strap-like, smooth, with a dense conical mat of hyphae at the

base, unbranched ; surface an even black crust, concealed at first by a soft, cream-coloured, surface layer which cracks in a reticulated pattern, outline varying from almost even to distinctly nodulose with the perithecial tips, ostiolar papillae minute, conical, black. Ascospores 10·5–12 × 4·5–5μ, up to 15μ long according to Berkeley. Fig. 28.

Brasil : on sticks, Papunha, 5.11.1873, Trail 21, typus.

As it stands this species is known only from the type collection but if the superficial white coating wore off it would be hard to distinguish from *X. berkeleyi*. Its mottled black and white surface gives it a superficial resemblance to the " *X. rhopaloides* " state of *X. curta* but there is no indication of cracking in the black crust.

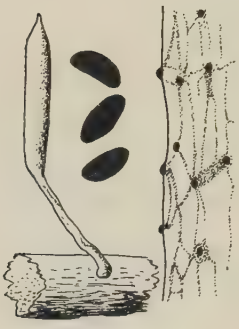

Fig. 28. *Xylaria pallida* Berk. & Cooke. Stroma natural size and small portion enlarged, ascospores × 660, from Trail 21.

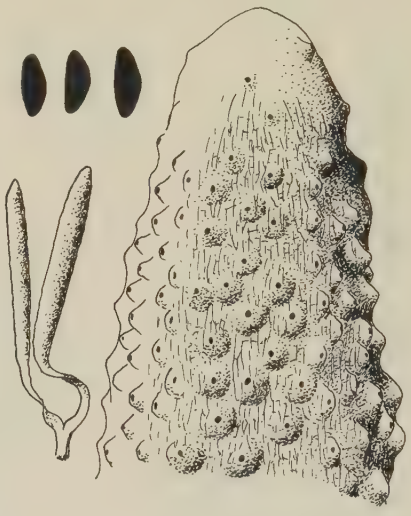

Fig. 29. *Xylaria berkeleyi* Mont. Stromata natural size, apex enlarged, ascospores × 660.

Xylaria berkeleyi *Mont. apud Cooke* in Grevillea **11,** 85 (March 1883).

Xylaria cordovensis Berk. apud Cooke, op. cit.

Stromata narrowly cylindrical, up to 4 cm. long and 3 mm. wide, with rounded or slightly pointed tips and well defined, somewhat strap-like, smooth stalks, often with a dense basal pad of mycelium and sometimes forked at the base ; stroma surface black, very finely and minutely reticulately cracked, rough with the large conical ostiolar papillae. Ascospores 11–16 × 3·5–4·5μ. Fig. 29.

French Guiana : three collections from Montagne, two sent to Berkeley as *Hypoxylon corniforme* Mont. and one as *Xylaria berkeleyi* Mont.

Montagne (1855) stated that he first distributed the species to his friends as *Sphaeria corniformis* Fr. but corrected the name to *X. berkeleyi* prior to publication. He did not print a diagnosis as he thought his fungus the same as *Sphaeria furcata* Berk. & Curt. non Fries. It seems likely that, in changing his mind about the determination, Montagne was influenced by Berkeley's concept of *S. corniformis*, viz the fungus here called *X. longipes* Nits. All Montagne's specimens at Kew cited above

are rather old and weathered but in places they appear to show traces of a thin superficial layer covering the crust.

Xylaria grammica (*Mont.*) *Fr.* in Nov. Act. Reg. Soc. Sci. Upsal. Ser. 3, **1,** 128 (1851).

Hypoxylon grammicum Mont. in Ann. Sci. Nat. Bot. Ser. 2, **13,** 331 (1840).

Xylaria macropoda Speg. in An. Mus. Nac. Buenos Aires **19,** 347 (1909).

Stroma cylindric-clavate to cylindric-fusiform with the apex obtusely rounded or tapering to a sterile point, stalk rather well defined, smooth and slender, often very long, the whole up to 24 cm. long and 1·5 cm. wide ; surface grey, becoming black, the crust very minutely granulate, interrupted by subparallel, sparingly anastomosing, longitudinal cracks, along which the minute, convex, ostiolar papillae emerge in vertical rows. Ascospores 11·5–15 × 3·5–4μ. Fig. 30.

On dead wood.

Fig. 30. *Xylaria grammica* (Mont.) Fr. Stroma natural size and portion of the crust enlarged, ascospores × 660, all from Balansa 2709, annotated "Typical" by Lloyd.

Argentina : Tucuman, April 1906, typus of *X. macropoda* in Herb. Spegazzini.

Paraguay : sur les troncs pourris, Guarapi, Juillet 1881, Balansa 2709.

Cuba : Wright 307.

The cracking of the stromatic crust in this species is very distinctive, as also are the rows of ostioles within the cracks. In other species with regularly fractured crusts the cracks surround individual perithecia or form a network between them. I have not seen the type collection, from French Guiana, but this is one of the few Xylarias which have been consistently interpreted and Montagne's careful diagnosis and published figure leave no doubt the traditional interpretation is correct. Collections determined by Lloyd as *X. cristata* Speg. seem to be slender states of *X. grammica*, perhaps separable under the name *X. venustula* Sacc. ; the type collection of *X. cristata* appears to me indistinguishable from *X. hypoxylon*.

Xylaria kegeliana (*Lév.*) *Fr.* in Nov. Act. Reg. Soc. Sci. Upsal. Ser. 3, **1,** 125 (1851).

Sphaeria kegeliana Lév. in Ann. Sci. Nat. Bot. Ser. 3, **5,** 256 (1846).

Stroma simple, narrowly cylindrical, up to 4 cm. high and 5 mm. thick, tapering below to a slender smooth stalk with blackish discoid base, apex sterile and pointed ; crust pale fawn, smooth, neither cracked nor split but marked with more or less distinct, pale yellowish, longitudinal, anastomosing stripes, within which the ostioles emerge ; perithecia completely immersed, ostiolar papillae convex, black, shining. Ascospores dark brown, translucent, 25–30 × 6–8·5μ, pointed at the ends. Fig. 31.

On trunks.

Dutch Guiana : prope Paramaribo, June 1844, Kegel 575, typus in Herb. Paris.

In stature this recalls *X. grammica*, in colour and spores it resembles *X. dealbata*.

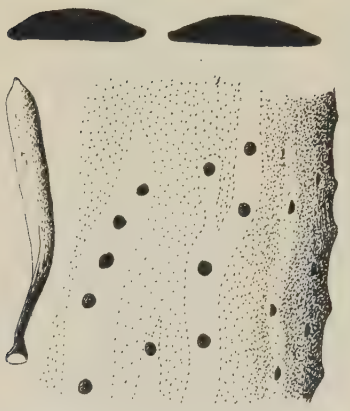

Fig. 31. *Xylaria kegeliana* (Lév.) Fr. Stroma natural size, portion of crust enlarged, ascospores × 660, from Kegel 575.

Fig. 32. *Xylaria dealbata* Berk. & Curt. Stromata natural size and small portion of crust enlarged, ascospores × 660, from Broadway 5830.

Group 8. Species with a hard smooth crust and rounded tips, stalks not strap-like, usually short and stout.

Xylaria dealbata *Berk. & Curt.* in J. Acad. Nat. Sci. Philadelphia, N.S. **2,** 284 (1853).

Xylaria ridleyi Massee in Kew Bull. 118 (1898).

Stromata gregarious or solitary, clavate, up to 3 cm. long and about 1 cm. thick, rounded above, seated on well defined, slender, simple, smooth, cylindrical stalks ; flesh at first white, ultimately blackening throughout, becoming hollow, very brittle ; perithecia completely immersed, crust cream coloured, marked by a network of fine grey lines, ostioles minute, black, punctate, not at all papillate. Ascospores 24–33 × 6–11μ, pointed at each end. Fig. 32.

Surinam : typus ex Herb. Schweinitz. Only a fragment of the crust remains but this is sufficient to indicate that Lloyd's final interpretation of the species was correct ; according to the diagnosis the collection was immature and lacked ascospores.

Brasil : Amazonas, Panuré, in truncis putridis, Spruce 145.

Trinidad : on a decaying tree, Aripo road, 2½ miles from Arima, 16.10.1925, Broadway 5830.

Old stromata tend to split longitudinally and become involute, as in *X. telfairii*. It seems probable that *X. cretacea* Berk. & Br., from Australia, is merely a large state of the present fungus. Lloyd attempted to separate the two species on account of the white flesh in *X. cretacea* but that of *X. dealbata* is white at first and was so described in the original diagnosis.

FIG. 33. *Xylaria aenea* Mont. Stroma natural size, small portion of crust enlarged, ascospores × 660, from Fendler 253.

Xylaria aenea *Mont.* in Ann. Sci. Nat. Bot. Ser. 4, **3,** 100 (1855).

Stroma simple, cylindric-clavate, up to 7 cm. long and 2 cm. thick, rounded above, narrowed below to a short, smooth, slender stalk, with a discoid base ; perithecia completely immersed, crust smooth but becoming deeply wrinkled on drying, dotted with the small, black, discoid, nonpapillate ostioles ; flesh whitish, hollow. Ascospores inaequilateral, straight or slightly curved, 30–40 × 5–8μ. According to Leprieur the colour of fresh stromata is " un gris rougeatre ", Montagne described them as bronze, old herbarium material now ranges from dark grey-brown to purplish-black. Fig. 33.

On dead wood.

French Guiana : in ligno emortuo apud Cayennam, Leprieur 1399 in Herb. Paris.

Venezuela : Fendler 253.

Montagne cited as cotypes two collections, Leprieur 1197 and 1399. The latter, sent me on loan from Paris, is sterile but, taken in conjunction with Montagne's spore data, presumably taken from 1197,

" Sporae magnae, cymbiformes, inaequilaterae, altera convexae, altera rectiusculae, 3 centimillim. longae, centimillim modo crassae ", it leaves no doubt as to the identity of the species.

Xylaria guyanensis (*Mont.*) *Fr.* in Nov. Act. Reg. Soc. Sci. Upsal. Ser. 3, **1,** 127 (1851).

Hypoxylon guyanense Mont. in Ann. Sci. Nat. Bot. Ser. 2, **13,** 343 (1840).

Xylaria albopunctulata Rehm apud Kellerman in Journal of Mycology **14,** 5 (1908).

Stromata solitary or in small clusters, cylindrical or cylindric-fusiform to slightly clavate, with short, stout, illdefined stalks, up to 10 cm. long and 1·5 cm. thick ; perithecia immersed, surface at first whitish, dotted with erumpent, black, papillate ostioles ; the outermost layer cracks irregularly at maturity and flakes off to expose a dark brown to black crust, bearing relatively large, discoid, only slightly convex, ostiolar discs about $\frac{1}{2}$–$\frac{3}{4}$ mm. across, which are usually black and shining but in old stromata may acquire a white papery surface as in the type of *X. albopunctulata* ; flesh whitish, at first solid, soon becoming hollow. Ascospores 14–21 × 5–8μ. Fig. 34.

On dead wood.

Fig. 34. *Xylaria guyanensis* (Mont.) Fr. Stroma natural size, authentic material from Montagne, portion of crust enlarged, showing stages in exposure of the ostiolar discs, from Miller 8825, ascospores × 660.

French Guiana : Cayenne, material from Montagne in Herb. Berk. & Herb. Cooke.

Trinidad : Verdant Vale, Arima, R. Thaxter, det. J. H. Miller 8825.

Venezuela : Yaracuy, forest north of San Pablo, 27.9.1932, Chardon 1326 ; Carabobo, Central Lucinda, 30.9.1932, Chardon 1456.

Guatemala : Los Amates, Dept. Izabal, 20.2.1907, W. A. Kellerman 6226b, typus of *X. albopunctulata* in Herb. Rehm, Stockholm.

Lloyd gave the name *X. exacuta* to a solitary collection from Brasil, with small stromata pointed at the tip, with a surface like that of *X. guyanensis* but ascospores 11–12 × 4·5–5μ. It is just possible this is a weathered state of *X. pallida*, see group 7.

In both the western and eastern tropics massive Xylarias are often collected, which are clearly closely akin to *X. guyanensis* but are usually given a different name because of their impressive stature. They fall into two categories, conveniently treated as species until their relationship with one another and with *X. guyanensis* is better understood, separated by the size of their ascospores, viz :

Xylaria poitei (*Lév.*) *Fr.* in Nov. Act. Reg. Soc. Sci. Upsal. Ser. 3, **1,** 125 (1851).

Sphaeria poitei Lév. in Ann. Sci. Nat. Bot. Ser. 3, **3,** p. 40, 1845.

Xylaria conocephala Berk. & Curt. in J. Linn. Soc. Bot. **10,** p. 379, 1869.

Xylaria titan Berk. & Curt. in Grevillea **4,** p. 47, Dec. 1875.

Xylaria hercules Speg. in An. Mus. Nac. Buenos Aires **19,** p. 347, 1909.

Xylaria morgani Lloyd in Mycological Notes **7,** p. 1249, January 1924.

This fungus has ascospores 14–19 × 5–7·5μ and differs from *X. guyanensis* in size, in its more solid flesh and in the surface not flaking away to expose such large ostiolar discs. To it may be assigned the following American collections :

Cuba : Wright 781, typus of *X. conocephala.*

Haiti : leg. Poiteau, cotypes of *X. poitei* in Herb. Paris.

Jamaica : St. Andrews, 8.12.1945.

Texas : Lindheimer 2646, typus of *X. titan.*

Argentina : Formosa 1900, Museo Inst. Spegazzini 3231, as *X. hercules.*

Judging from the description *X. lignosa* Ferd. & Winge, 1908, may be another synonym.

Xylaria regalis *Cooke* in Grevillea **11,** p. 86, March 1883.

Xylaria emerici Berk. apud Cooke in Grevillea **11,** p. 86, March 1883.

Xylaria tridactyla Rehm in Ann. mycol. **9,** p. 363, 1911.

These collections differ from those assigned to the preceding species only in their smaller ascospores, 12–15 × 4·5—6μ, as already noted by Cooke in his diagnosis of *X. regalis.* The type collections of this and of *X. emerici* are from India but the following American collections also belong here :

Trinidad : Verdant Vale, Arima, Cotton 2.

British Guiana : 8703, undated.

Chiapas : Escuintla, 25.2.1910, typus of *X. tridactyla.*

Xylaria telfairii (*Berk.*) *Fr.* in Nov. Act. Reg. Soc. Sci. Upsal. Ser. 3, **1,** 127 (1851).

Sphaeria telfairii Berk. in Ann. Mag. Nat. Hist. **3,** 397 (1839).

Hypoxylon enterogenum Mont. in Ann. Sci. Nat. Bot. Ser. 2, **13,** 342 (1840).

Xylaria enterogena (Mont.) Fr. op. cit. (1851).

Hypoxylon tabacinum Kickx in Bul. Acad. Roy. Bruxelles **8** (8) (1841).

Xylaria tabacina (Kickx) Fr. op. cit. (1851).

Xylaria wrightii Berk. & Curt. in J. Linn. Soc. Bot. **10,** 380 (1869).

Xylaria thwaitesii Berk. & Cooke in Grevillea **12,** 1 (Sept. 1883).

Probably also the following, based on immature material :

Sphaeria gigantea Zipp. apud Lév. in Ann. Sci. Nat. Bot. Ser. 3, **3,** 41 (1845).

Xylaria ventricosa Berk. apud Cooke in Grevillea **11,** 87 (1883).

Xylaria mascarensis Cooke in Grevillea **13,** 9 (Sept. 1884).

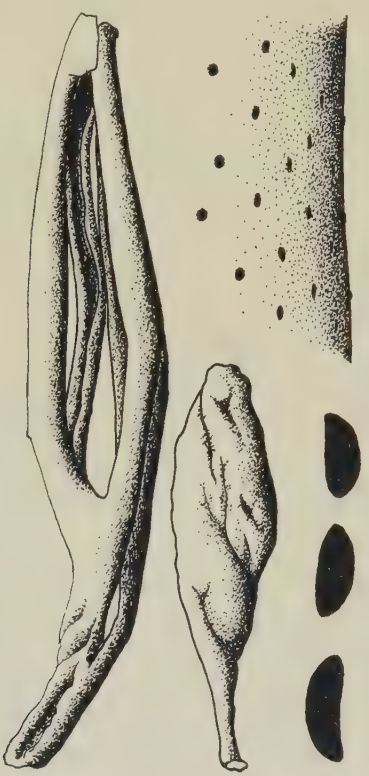

Fig. 35. *Xylaria telfairii* (Berk.) Fr. Stromata natural size, left from Corn Puss Gap, Jamaica, right from Martyn 634, small portion of crust enlarged, ascospores × 660.

Stromata solitary or a few together, cylindric-fusiform, up to 10 cm. long, exceptionally up to 15 cm. according to Kickx, about 1·5 cm. thick, with rounded tips and smooth, concolorous, rather illdefined stalks ; surface layer smooth, hard, varying from fawn to pale orange-brown, concealing a thick black crust which is not normally exposed even with age, dotted with small, black, discoid ostioles, scarcely raised above the level of the crust ; flesh whitish or pale buff, hollow, the stroma often splits down the middle and the broken edges curl inwards. Ascospores (15)–16–22–(25) × 6–8μ. Fig. 35.

The type collection of *X. telfairii* was from Mauritius. The following American specimens at Kew may be referred to this species :

Cuba : Fungi Cubenses Wrightiani 783, as *X. tabacina* ; Wright 595 ; Wright 308, typus of *X. wrightii*.

Jamaica : on rotting wood, Corn Puss Gap, St. Thomas, 20.2.1948 ; on palings, Cinchona, W. Fawcett, 13.6.1889.

Mexico : Xalapa, Mr. Harris ; Cordova, Nov. 1854, Sallé 87.

Costa Rica : C. W. Dodge 7585, 30.4.1930.

Colombia : on log, Piracuara, Rio Vaupes, 27.11.1952, Anglo-Colombian Cacao Exped. 153.

Trinidad : Hart, 6.1.1899 ; Quare Valley, D. H. Maggs, 23.9.1945, I.C.T.A. 735.

British Guiana : on dead log, Moraballi Creek, near Bartica, Essequibo River, 19.10.1929, E. B. Martyn 634.

Brasil : Barcellos, 30.6.1874, Trail 152, as *X. conocephala* ; Furquilha, Sta. Maria de Magdalena, Est. de Rio de Janeiro, leg. Santos Lima, Nov. 1926.

The typus of *X. enterogena* is an unusually small specimen in which the ostioles are mere pores in the crust, without exposed discs. In colouring, shape and ascospore characters, however, it agrees with *X. telfairii* and I think it to be merely a young state of that species. This view has not been generally held, however, and it may be convenient to list the collections which closely match the typus of *X. enterogena* separately below. All are obviously young stromata and most of them lack ascospores.

Costa Rica : C. W. Dodge, 7595, 8.12.1929.

Colombia : Jinagoje, Rio Apaporis, Vaupes, 6.11.1952, Anglo-Colombian Cacao Exped. 14.

British Guiana : upper Arawau River, N.W.D., May 1929, E. B. Martyn 45 ; Koreai Creek, January 1924, D. H. Linder 709, det. *X. enterogena* J. H. Miller 8819.

French Guiana ; ad truncos putridos in sylvis Sinnamariensibus, 1839, ex Herb. Montagne in Herb. Berkeley, authentic for *Hypoxylon enterogenum*.

The type collection of *X. thwaitesii*, from Ceylon, is *X. telfairii* and not the quite different species for which the name was adopted by Petch. I have not seen the typus of *H. tabacinum* and rely on Kickx's excellent coloured plate of his species. Judging by the description and figure it was this species that Rehm called *Xylaria ? conocephala* Berk. & Curt. in Hedwigia **40,** 145 ; so, probably, was *X. euglossa* Fr. 1851, from Costa Rica.

Cooke, in Grevillea **11,** 84 (1883) attempted to substitute for *X. telfairii* the name *X. involuta* (Klotzsch) Cooke, based on the name *Sphaeria involuta* written by Klotzsch on the type sheet when he revised the Hooker herbarium in Glasgow. This appropriate but unpublished name had been deliberately rejected by Berkeley when he published the collection as *Sphaeria telfairii*.

Xylaria allantodea (*Berk.*) *Fr.* in Nov. Act. Reg. Soc. Sci. Upsal. Ser. 3, **1,** 127 (1851).

Sphaeria allantodea Berk. in Ann. Mag. Nat. Hist. **3,** 397 (1839).

Hypoxylon obtusissimum Berk. in Ann. Mag. Nat. Hist. Ser. 2, **9,** 202 (1852).

Xylaria obtusissima (Berk.) Sacc. Syll. Fung. **1,** 318 (1882).

Sphaeria zeylanica Berk. in Hooker's London J. Bot. **6,** 513 (1847).

Xylaria zeylanica (Berk.) Berk. & Br. in J. Linn. Soc. Bot. **14,** 118 (1873).

Hypoxylon domingense Berk. in Ann. Mag. Nat. Hist. Ser. 2, **9,** 202 (1852).

Xylaria domingensis (Berk.) Sacc. Syll. Fung. **1,** 315 (1882).

Stromata cylindric-clavate, obtusely rounded at the tips, with short, stout, illdefined stalks, solitary or in small clusters, often slightly curved, up to 7 cm. long and usually about 1 to 2 cm. thick ; flesh whitish, becoming hollow ; perithecia completely immersed, crust smooth, purplish-black, neither cracked nor wrinkled but brittle and sometimes splitting longitudinally with the edges becoming involute, surface finely roughened by the minute, scattered, black, slightly protruding, ostiolar papillae. Ascospores 11–16 × 3·5–5μ. Fig. 36.

On dead wood.

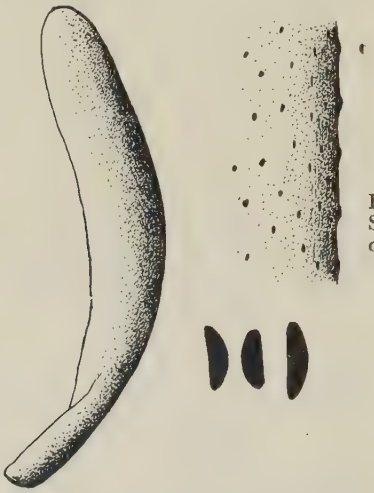

Fig. 36. *Xylaria allantodea* (Berk.) Fr. Stroma natural size and small portion of crust enlarged, ascospores × 660, all from the type collection.

Brasil : Type collection, unlocalised, well described by Berkeley as resembling a small black pudding ; Floresta da Tijuca, Rio de Janeiro, D.F., 340 m., leg. O. and K. Fidalgo, 17.7.1955.

Dominican Republic : Type collections of *X. domingensis* and *X. obtusissima*, Sallé 46 and 47.

The species seems to be more common in the eastern tropics ; *X. fistuca* Berk., from Nepal, with ascospores 10-12 × 4–5μ, is a probable synonym. Theissen (1908) has already indicated that *X. obtusissima* is the same as *X. allantodea* and added that it develops in Brasil hypoxyloid and penzigioid states which have received the names *Hypoxylon berterii* Mont., *H. enteroleucum* Speg., *H. airesii* Berk. and *Penzigia fusco-areolata* Rehm.

Xylaria cubensis (*Mont.*) *Fr.* in Nov. Act. Reg. Soc. Sci. Upsal. Ser. 3, **1,** 126 (1851).

Hypoxylon cubense Mont. in Ann. Sci. Nat. Bot. Ser. 2, **13,** p. 345, 1840, emend Lloyd in Mycological Notes **5,** Xylaria p. 4, 1918.

Stromata cylindrico-clavate, up to 4 cm. long and 1 cm. thick, with rounded tips and short stout stalks ; surface smooth, dotted with rather prominent conico-papillate ostioles, crust brown, then purplish black, minutely and irregularly reticulately cracked (" crazy "), between the ostioles ; flesh whitish, hollow. Ascospores 7–9 × 3–4·5μ. Fig. 37.

On logs.

Cuba : Wright 306, as *X. allantodea.*

Colombia : confluence of Rio Caguan and R. Guaya, 20.4.1953, Anglo-Colombian Cacao Exped. 308.

Trinidad : La Victoria, 18.6.1921, E. M. Wakefield.

French Guiana : on woody debris beside the R. Conana, Leprieur 403 and 404, 1839, in Herb. Paris.

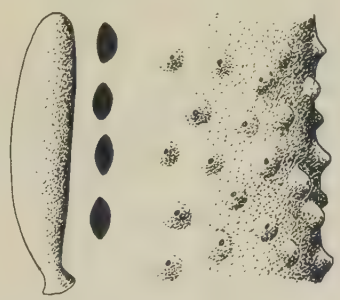

FIG. 37. *Xylaria cubensis* (Mont.) Fr. Stroma natural size and portion of crust enlarged, ascospores × 660, from Wright 306.

The Cuban material cited in the diagnosis cannot now be traced at Paris. The interpretation followed here is that of Lloyd who stated " I found it to be quite common in Cuba and it was very uniform in size and shape ". Fortunately his concept is confirmed by the two collections by Leprieur, cited above and listed by Montagne when he published his diagnosis. Leprieur 233, only doubtfully assigned here by Montagne, has ascospores 36–39 × 7–8μ and is presumably *X. aenea.*

Group 9. Stroma surface distinctly warted or with the crust corky and split into small rectangular areas by a regular network of deep cracks. The species in this group are mostly exceptionally polymorphic.

Xylaria feejeensis (*Berk.*) *Fr.* in Nov. Act. Reg. Soc. Sci. Upsal. Ser. 3, **1,** 128 (1851).

Sphaeria feejeensis Berk. in Hooker's London Journ. Bot. **1,** 456 (1842).

Xylaria rhytidophloea Mont. in Ann. Sci. Nat. Bot. Ser. 4, **3,** 101 (1855).

Xylaria fuegiensis Speg. in Bol. Acad. Nac. Ciencias, Cordoba, **11,** Fungi Fuegiani, 68 (1887).

Xylaria antarctica Speg. op. cit. 67 (1887).

Xylaria trivialis Speg. in Bol. Acad. Nac. Ciencias, Cordoba, **11,** Fungi Puiggariani, 135 (1889).

Xylaria aspera Massee in Kew Bull. 174 (1899).

Xylaria obtusissima (Berk.) Sacc. var. *polymorphoides* Rehm in Hedwigia **40,** 144 (1901).

Stromata more or less cylindrical, with narrowly rounded tips and short, slender, more or less well defined stalks, occasionally slightly lobed at the tip, up to 4·5 cm. long and 5 mm. thick ; crust blackish-brown to black, soon becoming finely reticulately cracked so as to outline the individual perithecia, ostiolar papillae small, hemispherical, black ; stalks often tomentosely hairy at the base, elsewhere free from hairs but with a corky cracked surface. Ascospores elliptical to inequilateral, 8-10 (–11) × 4–5·5μ. Fig. 38.

On dead wood.

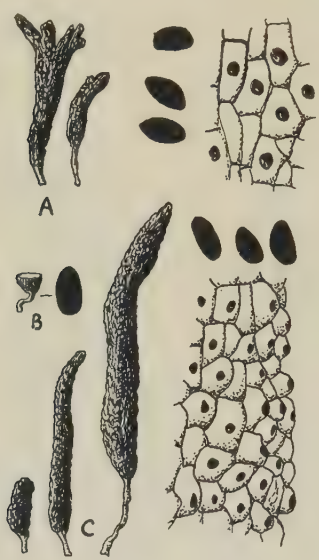

FIG. 38. *Xylaria feejeensis* (Berk.) Fr. Stromata natural size, portions of crust enlarged, ascospores × 660. A. from the type collection, B. the stunted flat-topped state called *Rhopalopsis berkeleyanum* by Cooke, C. from authentic material of *X. rhytidophloea* Mont.

The type collection came from the Fiji islands, leg. Hinds ; tropical American material seen includes the following :

Brasil : Estado de Sta. Catharina, Blumenau, auf abgestorbenem Baumstamen, E. Ule, Herbarium Brasiliense 793, as *X. obtusissima* Sacc. and cited by Rehm as his variety *polymorphoides* ; Apiahy, 1888, Puiggari 2779, typus of *X. trivialis* in Herb. Spegazzini ; Rio de Janeiro, D.F., leg. Pedro Occhiomi, 1926.

French Guiana : Cayenne, Leprieur s.n., authentic for *X. rhytidophloea*.

Trinidad : St. Augustine, 18.11.1945, R. E. D. Baker 748.

Dominica : on stump, Botanic Garden, E. M. Wakefield 96a, 6.12. 1920.

Jamaica : on bark of dead tree, Lady Musgrave Road, St. Andrew, A. Barry, 25.8.1944.

Xylaria ellipsospora Cooke & Massee, 1887, from Tasmania, is probably only a stout form of *X. feejeensis*. The *Kretzschmaria* state has been described from Guiana as *Hypoxylon heliscus* Mont., from Brasil as *Rhopalopsis berkeleyanum* Cooke = *K. berkeleyana* (Cooke) Berl. & Voglino, from New Caledonia as *K. scruposa* Pat. & Har. and from Java as *K. gomphoidea* Penz. & Sacc. *H. heliscus* Mont. 1840 antedates *S. feejeensis* Berk.

Xylaria curta *Fr.* in Nov. Act. Reg. Soc. Sci. Upsal. Ser. 3, **1,** 126 (1851).

Xylaria faveolis Lloyd in Mycological Notes **5,** Xylaria, 9 (Sept. 1918).

This name is applicable to stromata like those of *X. feejeensis* but usually stouter, often sessile and clustered, with the white or cream-coloured surface of the immature stroma cracked into small angular or rounded scales which persistently adhere to the surface between the convex ostiolar papillae. Ascospores similar to those of *X. feejeensis*, 8–12 × 4–5μ. Fig. 39.

FIG. 39. *Xylaria curta* Fr. Stromata natural size, from Wakefield 113, portion of crust enlarged, from Caracciolo 38, ascospores × 660.

The type collection of *X. curta*, Didrichson 28, from Oahu, Hawaiian Is., is well preserved in the University Botanical Museum, Copenhagen. Tropical American material seen included the following :

French Guiana : Leprieur 236 and unnumbered, as *Hypoxylon rhopaloides*, also a collection erroneously determined by Montagne as *X. platypoda* Lév.

Brasil : Amazonas, in truncis putridis, Panuré, Spruce 76 ; Rio Grande do Sul, in ligno, São Leopoldo, leg. Theissen, as *X. plebeja* ; Bono Principio, Municipio, Montenegro, 1928, det. J. H. Miller as *X. castorea* ; Jardim Botanico do Rio de Janeiro, leg. O. and K. Fidalgo, 11.7.1955 ; Chapadão de Quebra-Frasco, Terezopolis, Est. do Rio de Janeiro, leg. M. C. Vaughan Bandeira, 25.3.1926.

Trinidad : H. Caracciolo 38, 1910 ; Broadway s.n., 1909 ; River Estate, E. M. Wakefield, 113, 11.1.1921 ; Quare valley, 23.9.1945, D. H. Maggs, I.C.T.A. 733.

Various names have been applied to this curiously mottled fungus, which may eventually prove to be no more than a state of *X. feejeensis*. That most often employed is based on *Hypoxylon rhopaloides* Kunze apud Montagne 1840 but this was printed without a diagnosis and it is doubtful if a description appeared before that by Starbäck (1901) ; Saccardo in Sylloge fungorum 1, 1888, could only quote an ascospore size and add " Specie diagnosim loc. cit. non inveni ". Lloyd in 1920 also knew of no published description. Theissen, Bresadola and Petch all applied to it the name *Xylaria plebeia* Ces. but I do not feel certain Cessti's original collection from Sarawak was the present species. Miller apparently treats it as a state of *X. castorea* Berk, 1855, but the type collection of the latter, from New Zealand, has a jet black surface with no trace of the characteristic scales and the name is, no doubt, another synonym of *X. feejeensis*.

Xylaria longipes *Nitschke*, Pyrenomycetes Germanici 14 (1867).

Xylaria corniformis Fr. var. *macrospora* Bres. apud Theissen in Ann. mycol. 6, 342 (1908).

This is a very similar fungus to *X. feejeensis* but tends to be larger and has consistently larger ascospores, 10–16 × 5–6μ ; there is usually a large conical pad of felted mycelium at the foot of the short stalk.

X. longipes is fairly common on dead wood in Europe and there is a collection at Kew from Uganda. It appears to be less abundant in tropical America from which I have seen only the following typical collection :

Brasil : Rio Grande do Sul, São Leopoldo, typus of *X. corniformis* var. *macrospora* in Herb. Bresadola, Stockholm.

Miller, however, recorded a collection as *X. longipes* from Carabobo, Venezuela and *X. ippoglossa* Speg. is possibly to be interpreted as a state of *X. longipes* with smoother crust like that of *X. berkeleyi*.

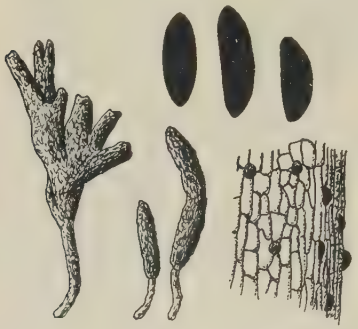

Fig. 40. *Xylaria scruposa* (Fr.) Fr. sensu Montagne. Stromata natural size and small portion of crust enlarged, ascospores × 660.

Xylaria scruposa (*Fr.*) *Fr.* in Nov. Act. Reg. Soc. Sci. Upsal. Ser. 3, **1,** 127 (1851).

Sphaeria scruposa Fr., Elenchus Fungorum **2,** 55 (1828).

Hypoxylon scruposum (Fr.) Mont. apud Ramon de la Sagra, Flora Cubana **1,** 214 (1853).

Sphaeria (*Cordyceps*) *trachelina* Lév. in Ann. Sci. Nat. Bot. Ser. 3, **5,** 304 (1846).

Xylaria trachelina (Lév.) Lév. in Ann. Sci. Nat. Bot. Ser. 4, **20,** 293 (1863).

Xylaria radicata Berk. & Curt. in J. Linn. Soc. Bot. **10,** 379 (1869).

Xylaria subtorulosa Speg. in Bol. Acad. Nac. Ciencias, Cordoba, **11,** Fungi Puiggariani, 137 (1889).

I have seen no material named by Fries and therefore follow the interpretation of Montagne, accepted by Lloyd and Miller. In this sense the fungus closely resembles *X. feejeensis* and *X. longipes* but has still larger ascospores, 16-22 × 6–8μ. The stromata may occasionally become lobed or even palmate at the tips. Fig. 40. The type collection of *X. subtorulosa* is a curious form with rather widely spaced and prominent perithecia.

Brasil : Apiahy, Puiggari 2909, typus of *X. subtorulosa* in Herb. Spegazzini ; Mata de S. Pedro, Brusque, Sta. Catarina, leg. Renaro José Jaccoud, 19.7.1955.

Venezuela : Fendler 250 in Herb. Berkeley as *X. corniformis*.

Colombia : Caño Unguya, Rio Apaporis, Vaupes, 4.11.1952, Anglo-Colombian Cacao Exped. 9 ; Mitu, Rio Vaupes, 3.11.1952, Anglo-Colombian Cacao Exped. 86 ; Tolima, leg. Justin Goudot, 1844, typus of *S. trachelina* in Herb. Paris.

Cuba : material named by Montagne in Herb. Berkeley ; Wright 578 in part, typus of *X. radicata* ; unnumbered collection determined by Berkeley as *X. multiplex*.

Xylaria leprosa Speg. and *X. transiens* Theissen bear the same ambiguous relationship to *X. scruposa* that *X. curta* bears to *X. feejeensis*, viz. a stouter fungus with scaly white surface. Anglo-Colombian Cacao Expedition 26, from Caño Unguya, Rio Apaporis, Vaupes, is a subsessile state of *X. scruposa* superficially resembling *Kretzschmaria berkeleyana*.

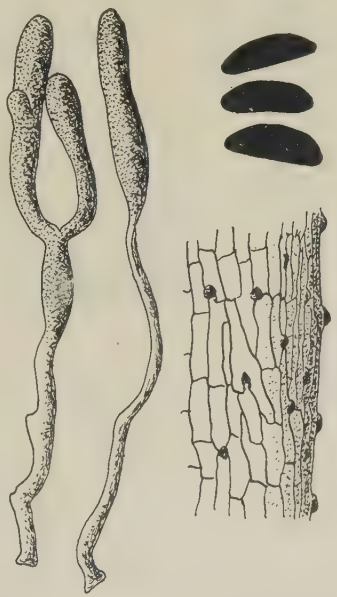

Fig. 41. *Xylaria hyperythra* (Mont.) Fr. Stromata natural size, small portion of crust enlarged, ascospores × 660, from Leprieur 1201.

Xylaria hyperythra (*Mont.*) *Fr.* in Nov. Act. Reg. Soc. Sci. Upsal. Ser. 3, **1,** 127 (1851).

Hypoxylon hyperythrum Mont. in Ann. Sci. Nat. Bot. Ser. 2, **13,** 343 (1840).

Xylaria hispidula Berk. & Curt. in J. Linn. Soc. Bot. **10,** 382 (1869).

Xylaria olobapha Berk. apud Cooke in Grevillea **11,** 84 (March 1883).

Stromata cylindric-clavate, simple or occasionally forked, about 5 mm. thick, apex rounded, stalk well-defined, long, slender, somewhat twisted or longitudinally furrowed when dry, with a slightly discoid base, the whole up to 8 cm. tall ; surface of the stroma soft, cinnamon-coloured, cracking into narrow rectangular patches, underlying crust black ; ostiolar papillae prominent, convex, black ; surface of the stalk covered with matted cinnamon-coloured hyphae ; flesh solid, buff. Ascospores blackish brown, opaque, 16–19 × 5·5–7μ. Fig. 41.

On rotting trunks in forests.

French Guiana : Leprieur 1201, in Herb. Paris, a corresponding specimen at Kew is sterile.

Cuba : Wright 526, typus of *X. hispidula.*

Brasil : Amazonas, Panuré, Spruce 143, typus of *X. olobapha.*

The type collection of *Xylaria columnifera* Mont. may possibly be a young state of *X. hyperythra* with the flesh destroyed by insects. It is exactly matched by Anglo-Comlombian Cacao Expedition P.H. 271, Puerto Ospina, Putumayo, 24.3.1953.

Fig. 42. The *Xylaria polymorpha* complex, stromata natural size, portions of crust enlarged, ascospores × 660. A. from Fries Sclerom. Suec. 221, a rather slender example of the common European form. B. the normal rugose form from Jamaica. C. type collection of *X. schweinitzii.* D. the type collection of *X. obovata.*

Xylaria polymorpha (*Pers. ex Fr.*) *Grev.*, Flora Edinensis 355 (1824).

Sphaeria polymorpha Pers. ex Fr., Syst. Myc. **2,** 326 (1823).

Xylaria schweinitzii Berk. & Curt. in J. Acad. Nat. Sci. Philadelphia N.S. **2,** 284 (1853).

Xylaria corrugata Har. & Pat. in Journ. de Bot. **17,** 13 (1903).

Stromata caespitose, gregarious or solitary, very variable in shape, from clavate to cylindric-fusiform, in tropical collections seldom more than 4 cm. long and 1·5 cm. wide, tip rounded, occasionally obscurely lobed, stalk usually clearly defined ; flesh white to pale buff, hard, solid or becoming hollow ; crust dark brown to black, varying from almost smooth with a tomentose outer layer cracked into minute dark brown scales to slightly mammilate, with minute, closely spaced, obtuse, black warts ; ostiolar papillae black, slightly convex. Ascospores 20–27 (–30) × 6–9·5(–12 μ). Fig. 42 A, B.

European collections are largely from rotting stumps and trunks of *Fagus* and tend to be larger and more coarsely rugose than those from the tropics. The state called *X. schweinitzii* has a nearly smooth wrinkled

crust and rather small ascospores 20–23 × 7 8μ (Fig. 42 C) but all stages can be found in West Indian material, connecting this with typical *X. polymorpha*. Miller (1934) adopted the name *X. schweinitzii* for Venezuelan collections but commented that he had " specimens from Costa Rica showing every variation from typical *schweinitzii* through to typical *polymorpha*. It is probably a tropical variant of the latter ". That being so I have felt it better to refer the tropical American collections to *X. polymorpha*, with comments on some of the more distinctive states represented. Lloyd, in Mycological Notes 7, p. 1354, referred this tropical form erroneously to *X. curta* Fr., the typus of which he had not seen.

Surinam : ex Herb. Schweinitz, typus of *X. schweinitzii*.

French Guiana : Cayenne, Leprieur 226, typical *X. polymorpha*, also three unnumbered specimens from Montagne in Herb. Currey which approach the *X. schweinitzii* state.

British Guiana : Moraballi Creek, Essequibo River, Martyn 575 ; Georgetown, Bartlett 8710.

Brasil : Bahia, Blanchet de Laurane 10 ; Amazonas, Panuré, Spruce 142, *schweinitzii* state ; Jardim Botanico de Rio de Janeiro, leg. O. and K. Fidalgo, Nov. 1955 ; Bosque de Sta. Helena, P. N. da Serra dos Orgãos, Terezopolis, Est. do Rio de Janeiro, leg. N. Azevedo, 8.2.1944.

Venezuela : on logs in rain forest, Mt. Periquito, Rancho Grande, Dennis, s.n., Nov. 1949.

Colombia : on dead wood, Jinagoje, Rio Apaporis, Vaupes, 6.9.1952, Anglo-Colombian Cacao Exped. 11 ; on fallen trunk in forest, Morichal, Rio Papunawa, 24.2.1953, Anglo-Colombian Cacao Exped. 249, *schweinitzii* state.

Costa Rica : C. W. Dodge 7207, 28.3.1930, *schweinitzii* state.

Trinidad : La Victoria, 18.1.1921, E. M. Wakefield 242.

St. Vincent : Rev. Guilding 19.

Jamaica : at root of old palm tree, Lady Musgrave Road, St. Andrew, 20.9.1944, A. Barry.

Cuba : Wright 300, 305, 508, 527, various stages from typical *X. polymorpha* to the *X. schweinitzii* state ; unnumbered specimen from Montagne as " *Hypoxylon digitatum* Nob. formae perquam variae cum *H. polymorpha* confluent " in Herb. Berkeley, this is typical *X. polymorpha*, with ascospores 21–27 × 6·5–9·5μ.

Xylaria anisopleura (*Mont.*) *Fr.* in Nov. Act. Reg. Soc. Sci. Upsal. Ser. 3, **1,** 127 (1851).

Hypoxylon anisopleura Mont. in Ann. Sci. Nat. Bot. Ser. 2, **13,** 348 (1840).

This is little more than an extreme form of the *X. polymorpha* complex, characterised by its small size and more protuberant perithecia. The ascospores measure 22–34 × 7–10μ. Fig. 43, lower half.

French Guiana : in sylvis montosis Kaw, a Cayenne viginti circiter leucas distantibus, ad ligna putrida, Maio 1838, Leprieur 438, type number from Montagne in Herb. Berkeley.

British Guiana : Pl. Voyhead, D. H. Linder 882, 11.1.1924, det. J. H. Miller as 8658.

Trinidad : Emperor Valley, Port of Spain, R. Thaxter ; River Estate, 13.1.1921, E. M. Wakefield 176.

Venezuela : on logs in rain forest with *X. polymorpha*, Mt. Periquito, Rancho Grande, Maracay, Nov. 1949.

Typical collections of this curious little fungus look quite unlike any state of *X. polymorpha* found in Europe but apparent transitional forms difficult to place do occur in the tropics. The flat-topped, caespitose, *Kretzschmaria* state has been called *K. knysnana* van der Bijl.

Xylaria obovata (*Berk.*) *Fr.* in Nov. Act. Reg. Soc. Sci. Upsal. Ser. 3, **1,** 127 (1851).

Sphaeria obovata Berk. in Ann. Mag. Nat. Hist. **3,** 397 (1839).

This is another extreme member of the *X. polymorpha* complex, with a short, smooth stalk, which swells out more or less abruptly into an obovate to subglobose fertile head. The latter is hollow, lined with a papyraceous coat, the crust black and brittle, minutely reticulately cracked, dotted with the low, convex, discoid, ostiolar papillae, which may be scarcely distinguishable from the surrounding crust. Ascospores 20-26 × 6-8·5μ. Fig. 42 D.

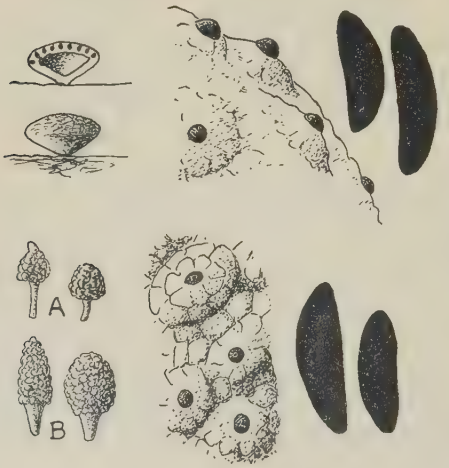

Fig. 43. Upper figures from the type collection of *Kretzschmaria rugosa* Earle; lower figures *Xylaria anisopleura* (Mont.) Fr., A. from Miller 8665, B. from Leprieur 438. Stromata natural size, portions of crust enlarged, ascospores × 660.

The type collection was from Rev. L. Guilding, St. Vincent, some time about 1830, and was given by Klotzsch the manuscript name *Sphaeria polymorpha* var. *Sancti Vincentis*. Berkeley did not annotate the sheet when he published the species and it has remained overlooked at Kew ever since. There can, however, be no doubt this is the material to which he referred, no other *Xylaria* collection from Guilding in the Hooker herbarium accords with Berkeley's diagnosis. Similar smooth hollow Xylarias are not uncommon in the eastern tropics, whence they have been received in quite uniform collections. In the West Indies, however, *X. obovata* is linked with the *X. polymorpha* complex by the odd little fungus from St. Kitts called *Kretzschmaria rugosa* Earle. This has subglobose or somewhat

flattened, black, hollow stromata, 1 cm. across, sessile or short-stalked, with distinctly rugose crusts and convex ostiolar papillae ; ascospores 24–29 × 7–10μ. Fig. 43, upper half.

Group 10. Soft-fleshed species with dichotomously branched stromata, smooth crust and small immersed perithecia.

Xylaria ruginosa *Mont.* in Ann. Sci. Nat. Bot. Ser. 4, **3,** 103 (1855).

Stroma dichotomously forked, up to 8 cm. high, stalk 2–3 mm. thick, fertile apical portion sharply delimited, up to 1·5 cm. long, cylindric-clavate, 3–4 mm. thick, with rounded tip ; crust thin, black, smooth, closely dotted with minutely papillate ostioles, neither cracked nor split but much wrinkled by shrinkage of the loose-textured, soft, buff, fibrous flesh ; surface of the stalk tomentosely felted. Ascospores opaque, 10–11 × 4·5—5μ. Habitat " ad truncos putridos " according to Montagne, though the surface of the stalk bears numerous embedded sand grains, suggesting it may have been buried in soil as far as the uppermost forks. Fig. 44.

Fig. 44. *Xylaria ruginosa* Mont. Stroma natural size, base of fertile portion enlarged, ascospores × 660, from the type collection in Herb. Paris.

French Guiana : Leprieur s.n., typus in Herb. Paris.

Lloyd, in Mycological Notes 5, Xylaria p. 21, suggested this was a synonym of *X. arbuscula* but he had not seen the species and his suggestion is obviously unacceptable.

Group 11. Small discoid, stipitate stromata, with mammiform perithecia like those of Group 4.

Xylaria guaranitica (*Speg.*) *Dennis*, comb. nov.

Kretzschmaria guaranitica Speg. in An. Soc. Cient. Argentina **18,** 276 (1884).

Xylaria discoidea Lloyd in Mycological Notes **5,** Xylaria notes, 13 (Sept. 1918).

Stroma unbranched, discoid, up to 4 mm. across, the margin and upper surface covered with semi-immersed mammiform perithecia, the under

surface slightly concave, smooth, seated on a central, slender, dark-brown stalk about $\frac{1}{2}$ mm. thick, with a long rooting base ; flesh white, solid ; surface of the perithecia dark purplish brown to nearly black, with a paler area around the prominent, hemispherical, shining black, ostiolar papilla. Ascospores dark brown, 24–27 × 9–10μ, with a short hyaline appendage at each end. There is occasionally an isolated free perithecium near the tip of the stalk. Fig. 45.

Brasil : Santa Catharina, leg. J. Rick, Herb. Lloyd 12642, type collection of *X. discoidea.*

Paraguay : ad ramos dejectos putrescentes in sylvis subvirgineis prope Guarapi, 1881, Balansa 3356, typus of *K. guaranitica* in Herb. Spegazzini.

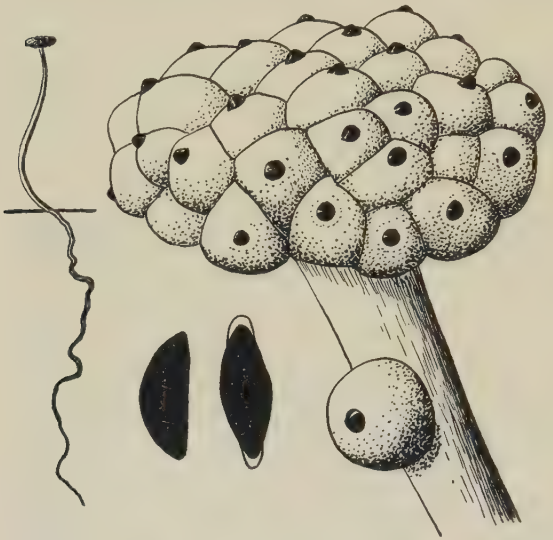

Fig. 45. *Xylaria guaranitica.* Stroma natural size, fertile head enlarged, ascospores × 660, from Herb. Lloyd 12642.

Lloyd found longer ascospores and suggested his species might be a synonym of the type species of *Xylariodiscus, X. dorstenioides* Hennings 1899, from Tijuca, Rio de Janeiro. Hennings figured ascospores 35–45 × 14–18μ with a hyaline appendage at each end. As regards the genus *Xylariodiscus* Theissen (1908) justly commented " Der Unterschied zwischen *Xylaria* und *Xylariodiscus* liegt einzig in der diskus- oder besser schirmartigen Ausbildung der Keule. Es fragt sich, ob dieser Unterschied die generische Abtrennung rechtertigt. Ich meine, wenn eine schirmartige Keule die Aufstellung einer eigenen Gattung erfordert, so müssen wir für *Xylaria aristata* mit kugeligem Köpfchen ebenfalls eine *Xylariosphaera* einführen, für *Xylaria Thyrsus* mit kegelförmiger Keule eine *Xylariocone* usw."

Xylaria pyramidata Berk. & Br., from Ceylon, somewhat similar to *X. guaranitica* in general appearance, has ascospores only 5·5–6·5 × 2·5–4μ ; *X. kurziana* Currey, from Bengal, has ascospores 14–16 × 7–8μ and perithecia yellow when fresh.

Group 12. Coprophilous species with small heads of almost free perithecia and large elliptical ascospores with gelatinous envelopes. This group contains species intermediate in characters between *Xylaria* and

Poronia and has a better claim than *Xylariodiscus* for recognition as a small but welldefined genus.

Xylaria chardoniana (*Toro*) *Miller* in Monog. Univ. Puerto Rico, Ser. B, **2,** 214 (1934).

Poronia chardoniana Toro in New York Acad. Sci. Survey Porto Rico **8** (1), 68 (1926).

Stroma small, containing up to 5 perithecia, each somewhat pyriform with its upper portion protruding, stalk cylindrical, rather short, brown, smooth, not rooting deeply in the dung ; crust of the perithecia smooth, brown, ostioles broad, discoid, black, the whole stroma less than 2 mm. across. Ascospores elliptical, 30–42 × 15–18μ, each surrounded by a gelatinous envelope. Fig. 46.

On dung of horse and cow.

FIG. 46. *Xylaria chardoniana* (Toro) Miller, below, and *Poronia leporina* Ell. & Ev., above. Stromata natural size on surface of dung and enlarged, ascospores × 660.

Puerto Rico : Vieques island, 18.7.1924, typus in Herb. New York Bot. Gard.

Reported also by Miller (1934) from Trujillo state, Venezuela.

This differs from the temperate species *X. pedunculata* (Dicks. ex Berk.) Fr. in its smaller stromata without rooting bases and in its rather smaller ascospores ; those of *X. pedunculata* measure 40–58 × 19–24μ.

Poronia leporina Ell. & Ev. 1890, recorded on rabbit droppings in Bermuda and Florida, evidently belongs here but differs from *X. chardoniana* in its more numerous perithecia and much smaller ascospores, 14–17

× 7–9μ. Those of *X. tulasnei* Nitschke, on rabbit droppings in Europe, measure 21–24 × 11–12μ.

The writer's thanks are due to the authorities of those herbaria from which it has been possible to borrow specimens, also personally to Madame Le Gal and Dr. M. S. Christiansen for seeking collections named by Montagne and Fries respectively and to Mr. N. Y. Sandwith for naming host plants.

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Drawings of British Plants.*—Part IX completes our tour of the *Rosaceae*, and sees Miss Ross-Craig, our cicerone, emerge surprisingly unscathed from a thicket of Brambles and Briars. It is no small accomplishment to have ended this prickly part of the journey so successfully.

The Roses, which occupy fourteen pages of the present part, are all excellently characterized, and though they lack the esculent qualities of the Brambles, so lusciously portrayed in the previous instalment, yet, in compensation, one can hope that with the aid of these illustrations the more venturesome among us may now dare to trespass furtively on what has been for too long the domain of the super-specialist.

But it is not Roses all the way—for the part also includes detailed studies of *Aphanes*, *Agrimonia*, *Poterium*, *Sanguisorba*, *Pyrus*, *Malus*, *Mespilus*, *Cotoneaster* and *Crataegus*, and, in addition, a very useful series of *Alchemilla* and *Sorbus* drawings. These two last-named genera, second only to *Rubus* and *Rosa* in complexity, are treated with that degree of cautious enterprise which is such a noteworthy feature of the series. Some extremist is sure to complain that his favourite micromorph has been unjustifiably omitted, but I think most of us will be content to follow our guide along the *via media*.

R. D. Meikle.

* Drawings of British Plants, part IX Rosaceae (2), Stella Ross-Craig, London: G. Bell & Sons Ltd., 39 plates, price 8/6 net.

NOTES FROM THE EAST AFRICAN HERBARIUM : IV*.

Bernard Verdcourt
Assistant Taxonomic Botanist, East African Herbarium.

The holotypes of the species described in the present notes are deposited in the East African Herbarium and in every case isotypes have been sent to Kew and in many cases also to other institutions. Particular mention must be made of the very excellent work of Dr. W. J. Eggeling, lately Chief Conservator of Forests, Tanganyika and his staff (particularly Mr. S. Semsei) who have in a few years discovered an amazing number of plants either new to Tanganyika or entirely new to science. It will take many years to work out the apparently new species found by these collectors. Some of their most important finds are numerous species known previously only from the type specimens, some of which have been destroyed in the Second World War.

CAPRIFOLIACEAE

Sambucus adnata *Wall. ex DC.*, Prod. **4,** 22 (1830).

This shrub does not appear to have been recorded for Tanganyika.

Tanganyika. Northern Province, Masai District, Northern Highlands, Embagai Crater, in *Hagenia* forest, 3400 m., Feb. 1954, *Eggeling* 6788 (EA, K) :—shrub to 2·6 m. tall with soft hollow stems, flowers white.

COMPOSITAE

Acanthospermum australe (*L.*) *Kuntze*, Rev. Gen. 303 (1891).

This plant is now a very common weed in many parts of Nairobi and is spreading rapidly along the Nakuru road having reached Muguga. This spread has taken place in the past four years.

Bidens grantii (*Oliv.*) *Sherff* var. **stapfioides** *Sherff*, var. nov. habitu varietati *stapfii* valde similis sed differt achaeniorum aristis (tenuibus stramineisque 2·5–4 mm. longis) ad apicem retrorsum 1–3-hamosis.

Tanganyika. Tabora, 1200 m., 12 April 1954, *F. G. Smith* 1134 (EA, holotype, Sherff photograph No. 4416) :—tall erect herb up to 1·5 m., on fold of rich ground near hill-top.

Earl E. Sherff, Chicago Natural History Museum, Chicago, Illinois, U.S.A.

Coreopsis (sect. *Eucoreopsis* Nutt.) **odora** *Sherff* sp. nov.

Frutex ± 4 dm. altus, erectus, glaber, caule gracili obtuse tetragono sulculatoque circ. 2–3 mm. crasso, ramis gracillimis erectis suberectisve internodiis superioribus 4–5·5 cm. longis et conspicuis terminaliter corymboseque 3–7-capitulatis. *Folia* opposita, circ. 2–4 cm. longa, bipinnatifida, rhachi segmentisque filiformi-linearibus et 0·4–0·7 mm. latis, ultimis acerrimis, petiolo minute ciliolato saepius 5–10 mm. longo. *Inflorescentia* suaveolens ; capitula exserta, radiata, tenuiter pedicellata, pedicello glaberrimo 1–3 cm. longo, pansa ad anthesin circ. 2·5–3 cm. lata et ± 7 mm. alta. *Involucri* glabri ; bracteae exteriores circ. 8, lineares, apice acriter cuspidatae, circ. 5–6 mm. longae, quam interiores lanceolato-oblongae quarto longiores. *Flores ligulati* 7 vel 8, flavi, circ. 1·2–1·5 cm.

* Continued from K.B. **1955,** 609 (1956).

longi ; ligulae lineari-oblongae ± 10-striatae apice circ. 3-denticulatae. *Flores tubulosi* : corollae glabrae et circ. 4 mm. longae, exannulatae. *Achaenia* valde immatura, obcompressa, cuneato-linearia, una facie plana glabraque, altera convexa longitudinaliter costulata costulis antrorsum hispidulis, marginibus apiceque erecte setulosis corpore biaristato circ. 2 mm. longo, aristis 2 2·5 mm. longis dense antrorso-setulosis paleas oblongas atropurpureas facile superantibus.

Tanganyika. Southern Highlands Province, Njombe District, Mdapo, March 1954, *S. R. Semsei* 1655 (EA, holotype, Sherff photograph No. 4415) :—shrub, flowers yellow, in mountain grassland.

The fragrance of the inflorescence comes seemingly from the capitula and suggests the odour found in *Covillea divaricata* (Cav.) Vail of the south-western United States, also that found in *Coreopsis suaveolens* Sherff of Chile, a species of the section *Pseudo-Agarista* A. Gray, Proc. Amer. Acad. **22,** 428 (1887).

In my revision of the genus *Coreopsis* (Bot. Ser. Field Mus. Nat. Hist. **11,** 279–495, ff. 1–3 (1936), *C. odora* would best stand between *C. chippii* (p. 361) and *C. scopulorum* (p. 362). From *C. chippii* (of southern Sudan) it differs in having longer and more readily evident internodes (in *C. chippii* these are but 5–12 mm. long and concealed by the densely crowded leaves), glabrous (not puberulous) branchlets, only 8 (not 10–20) outer phyllaries, these glabrous (not hispid) and apically cuspidate (not obtuse or even subtruncate) etc. From *C. scopulorum* (known only from Mt. Garguez, Kenya Colony) it differs in its more delicate branches and the gradual transition of their upper internodes into pedicels (in *C. scopulorum* the internodes are robust and short to the base of the pedicels, which latter are abruptly elongate and more slender). In a former paper (Amer. Journ. Bot. **34,** 157 (1947), I described still another species to which *C. odora* is closely allied : *C. morotonensis* from Mt. Moroto, Uganda. In that species, however, the leaf-segments are mostly 2–3·5 mm. wide, giving a distinctly different general appearance to the herbarium specimens. Earl E. Sherff, Chicago Natural History Museum, Chicago, Illinois, U.S.A.

Helichrysum antunesii *Volkens et Hoffm.* in Engl., Bot. Jahrb. **32,** 149 (1902).

The specimens mentioned below were at first annotated as being a new species but a thorough search at Kew has convinced the writer that they are referable to the above species first described from Angola.

Uganda. Langia, Imatong Mountains, grassland, 2790 m., April 1943, *Purseglove* 1422 (EA, K, KAW) :—herb to 0·3 m., flowers white. Zeu, West Nile, April 1940, *Eggeling* 3891 (K) :—flowers white. Imatongs, 2580 m., April 1938, *Eggeling* 3605 (K) :—flowers white. S.E. Imatongs, Lomwaga Mt., 2550 m., 5 April 1945, *Greenway & Hummel* 7287 (EA, K) : —a perennial white-flowered herb up to 0·23 m. tall, growing in a dense clump in burnt *Exotheca abyssinica–Elionurus argenteus* grassland ; locally common but scattered with *Vernonia smithii, Gladiolus quartinianus* in an almost black sandy loam amongst rocks on the crest of a mountain.

Belgian Congo. Mwendo, January 1946, *Hendrickx* 3792 (EA) :—" ize " (vernacular). Muganzo, November 1945, *Hendrickx* 3595 (EA).

Vernonia kandtii *Muschler* in Engl., Bot. Jahrb. **46,** 87 (1911).

Tanganyika. Bukoba District, Bugandika, 1200 m., January 1932, *Haarer* 2456 (EA, K).

Belgian Congo. Ruanda, Nyansa Berg, 1700 m., *Kandt* 69 (EA, isotypes).

Presumably the two isotypes in the East African Herbarium are the only ones in existence so it is worth equating them with another more widely distributed gathering. The plant is very distinct and there is no doubt as to the identity of the Haarer sheet.

Vernonia peculiaris *Verdcourt* sp. nov. (§*Lepidella*) ab omnibus speciebus africanis adhuc descriptis inflorescentiis peculiaribus (vide fig. 1) valde distincta.

Herba perennis ad 1 m. alta. *Caules* brunnei, striati, ramosi, pubescentes, internodiis ± 4·6 cm. longis. *Folia* ± membranacea, elliptica, apice ± acuminata, basi anguste cuneata, 8–11 cm. longa et 3·2–5 cm. lata, petiolata, petiolis 8–10 mm. longis ; lamina biserrata, subtus dense glandulo-punctata ; nervi laterales 5–6, utrinque pubescentes. *Inflorescentia* usque 14 cm. longa ; capitula ad nodos monochasiorum spiciformium disposita. *Capitula* homogama, 8 mm. alta et 6 mm. lata, circa 35-flora, breviter pedunculata, pedunculis veris ± 2 mm. longis ; involucri campanulati ; squamae 3–4-seriatae intus ad apices et extra pubescentes ; exteriores lineari-setaceae, basi ± dilatatae, 2·5 mm. longae et 0·1–0·2 mm. latae, patentes, intermediae lineari-oblongae, 4 mm. longae ; apice longe aristatae, interiores lineari-oblongae, 5 mm. longae et 1·2 mm. latae, apice acuminatae ; receptaculum ± 1·8 mm. diam. *Flores* tubulosi, lilacini, 3·3 mm. longi, e tubo cylindrico 1·4 mm. longo et 0·15 mm. lato sensim ampliati in limbum infundibuliformem 0·55 mm. in fauce diametientem, lobis oblongis 1·4 mm. longis et 0·3 mm. latis. *Antherae* 2 mm. longae, basi rotundatae, apice ± acutae, appendicibus ovatis acuminatis. *Stylus* ramis 1·8 mm. longis, infra partitionem hispidus. *Achaenia* oblonga, apice truncata, basi rotundata, 5-gona, 1·5 mm. longa et 0·6 mm. lata, leviter appresse pilosa. *Pappi* squamulae interiores 12 anguste lineares, barbellatae, 4 mm. longae, exteriores 25, minutae, semi-rotundatae, ciliatae.

Tanganyika. N.W. face of Gulwe Mt., 1200 m., 17 May 1937, *Hornby* 780 (EA, holotype, K, isotype). Shinyanga Hill, 1200 m., May 1935, *Burtt* 5119 (K, EA). Manyoni Kopje, 1320 m., 3 May 1932, *Burtt* 3660 (K, EA) :—a locally common purple-flowered herb with peculiar branched inflorescence, in shade of *Commiphora* and shrubs growing on rocky slopes.

This is one of the most distinct of all East African *Vernoniae* but it does not appear to have been described. It is one of the many strange plants which seem to be restricted to the Shinyanga area or only very local elsewhere in the central part of the territory (e.g. *Pentas graniticola*, *Triumfetta shinyangensis*, *Becium albostellatum* etc.). Since the odd nature of the inflorescence is difficult to describe it has been thought essential to give a figure (fig. 1), which will enable the plant to be recognised at a glance.

V. cinerea (L.) Less. (§ *Tephrodes*) is similar in the shape of the capitula but has a totally different inflorescence.

LABIATAE

Calamintha uhligii (*Gürke*) *Verdcourt*, comb. nov.

C. elgonensis Bullock in Kew Bull. **1932,** p. 502 (1932).

Satureja uhligii Gürke in Engl., Bot. Jahrb. **36,** 128 (1905).

This species occurs on Hanang, Meru (T.T.), and Elgon. The above synonymy is based on an examination of an isotype of Gürke's species

Vernonia peculiaris Verdcourt. Sketch showing general appearance of the plant × ½ (Hornby 780).

which is preserved in the East African Herbarium. The field label actually bears the name *Calamintha uhligii* Gürke but the species was described in *Satureja*. A specimen of Mr. Bullock's proposed new species was sent to Berlin at the time and was returned " unmatched ".

PASSIFLORACEAE

Paropsia grewioides *Welw. ex Masters* in Oliv., F.T.A. **2,** 505 (1871).

The specimens cited below agree in every way with this Angolan species. It is by far the largest flowered species of the genus occurring in East Africa. There is a species belonging to a closely allied new genus which has been known for many years to occur near Abercorn which also has large flowers.

Tanganyika. Southern Highlands Province, Lindi District, Rondo Plateau, Mchinjiri, March 1952, *Semsei* 690 (EA, K) :—shrub to 4·5 m. tall, stems slender, common in mixed bush formation. Ditto, in grassy clearing, 810 m., 1 October 1951, *Bryce* 14 (EA, K) :—tree 9–12 m. tall, flowers greenish-yellow.

Portuguese East Africa. Niassa, entre Mueda e Mocimboa do Rovuma, 23 Sept. 1948, *Pedro & Pedrogão* 5312 (EA) :—arvore com cerca de 10 m. de altura, flores creme esverdeadas.

RHAMNACEAE

Phylica emirnensis (*Tul.*) *Pillans* var. **nyassae** *Pillans* in J. Sth. Afric. Bot. **8,** 27 (1942).

The following record appears to be the first since Goetze originally collected the plant. Pillans makes the usual error of attributing Ukinga to Nyasaland.

Tanganyika. Southern Highlands Province, Elton Plateau, Nth. Ukinga, Njombe District, 2610 m., May 1953, *Eggeling* 6607 (EA, K) :—low clump-forming subshrub 0·3 m. tall on rock outcrops, not unlike a subwoody *Veronica* in habit, flower buds and pinkish fruits enclosed in white wool.

RHIZOPHORACEAE

Cassipourea ruwensorensis (*Engl.*) *Alston* in Kew Bull. **1925,** 263 (1925).

This does not appear to have been recorded from Tanganyika before.

Tanganyika. Bukoba, Minziro Forest Reserve, 1200 m., *Watkins* 465 (EA) :—slender tree in understorey of dense semi-swamp evergreen forest ; " Musali " (Haya).

RUBIACEAE

Cladoceras subcapitatum (*K. Schum. et K. Krause*) *Brem.* in Hook. Icon. Pl. t. 3411 (1940).

The specimen cited below is a very poor sterile one but there is no question as to its identity. The species is practically unknown and has not previously been recorded from Kenya.

Kenya. Coastal Province, Rabai, Dec. 1933, *Joanna* s.n. (EA) :—a climber in the forest.

Cuviera semseii *Verdcourt* sp. nov. ab omnibus speciebus africanis adhuc descriptis, calycis lobis latioribus 4·7mm. latis differt.

Arbor parva, 5–6 m. alta. *Ramuli* rugulosi, glabri, griseo-ochracei, lenticellati ; internodiis 0·6–6 cm. longis. *Folia* chartacea, nigrescentia

(in sicc.), petiolata, petiolo 0·5 1·3 cm. longo, saepius setoso ; lamina elliptica, 5·5 8·5 cm. longa et 3·4 4·0 cm. lata, apice acuminata, acumine 0·75 cm. longo et 0·45 cm. lato, basi cuneata, supra glabra, subtus in axillis nervorum primariorum leviter domatio-barbellata, nervis lateralibus utrinsecus 4–5 utrinque prominentibus, venis reticulatis. *Stipulae* lineari-triangulatae, indivisae, 5 mm. longae et 1 mm. latae. *Inflorescentiae* axillares, oppositae, bracteolatae, cymosae, pedunculis 5 mm. longis, ramulis secundariis breviter pilosis 1 cm. longis. *Flores* pedicellati, pedicellis 2–3·5 mm. longis attingentibus. *Calycis tubus* turbinatus, sparse pubescens, 2 mm. longus et latus, lobis 5, ovatis, acuminatis, nervosis, foliaceis, sparse ciliatis, 8 mm. longis et 4·7 mm. latis, basi angustis. *Corolla* viridi-flava, tubo glabro 4·5 mm. longo, basi et apice 3 mm. lato, prope medium 3·75 mm. lato, intus pilis deflexis paleaceis 1 mm. longis dense annulato ; lobis 5 lineari-triangulatis, acuminatis, extra sparse pilosis, 6 mm. longis et 1·5 mm. latis. *Stamina* 5, fauce inserta ; antherae ± exsertae, anguste lineari-triangulatae, 1·5 mm. longae. *Ovarium* 5-loculare, ovulis solitariis pendulis. *Stylus* 7·5 mm. longus, apicem versus attenuatus ; stigma cylindricum, 1·1 mm. longum. *Fructus* ignotus.

Tanganyika. S.E. Kitangari, in " Makonde " thicket, 1943, *Gillman* 1332 (EA, K) :— small tree to 5 m., flowers pale yellow. Lindi District, Mchinjiri, Rondo Plateau, in swamp forest, 810 m., January 1952, *S. R. Semsei* 620 (EA, holo., K, PRE, BR, isotypes) :—fairly common shrub or small tree to 6 m., greenish-yellowish flowers ; " mmembe " (Kimwera).

Lagynias lasiantha (*Sond.*) *Bullock* in Kew Bull. **1931,** 274 (1931).

Cuviera australis K. Schum. in Engl., Bot. Jahrb. **28,** 78 (1899).

I have seen an isotype of Schumann's species (*Schlecter* 11958, PRE) and it is a *Lagynias* close to *L. pallidiflora* Bullock (Kew Bull. **1931,** 273) but the latter has glabrous or glabrescent inflorescences and the venation of the leaves more obsolete below. A full range of material is needed to investigate the status of *L. pallidiflora*. From descriptions I suspected conspecificity of *L. lasiantha* and *C. australis* and Miss Mayda Henderson of the National Herbarium, Pretoria confirms that in her opinion the two are conspecific.

Lasianthus grandifolius *Verdcourt* sp. nov. affinis *L. wallacei* E. A. Bruce, foliis latioribus, apice late truncatis differt.

Frutex vel arbor parva, 4·5 m. alta. *Ramuli* nigrescentes, rugulosi, glabri, internodiis 5 cm. longis. *Folia* opposita, margine revoluta, valde coriacea, petiolata, petiolo crasso 1·5–2 cm. longo ; lamina late oblonga, 13–16 cm. longa, 9·5–10·5 cm. lata, apice truncata vel emarginata, basi cuneata, primum subtus nervis sparse puberula, mox utrinque glaberrima, nervis lateralibus utrinsecus 14–15, utrinque prominentibus. *Stipulae* rigidae, triangulares, 1·1 cm. longae et 0·45 cm. latae. *Flores* 3–4, axillares, subsessiles. *Calyx* trilobatus, sparse tomentosus, urceolatus ; tubus 0·8 cm. longus, et apice 1 cm. latus ; lobi oblongo-orbiculati, apice rotundati, recurvati, 0·5 0·6 cm. longi et 1 cm. lati. *Corolla* carnosa, cerea, glabra, tubo cylindrico albo, 1·5 cm. longo et 0·8 cm. lato, supra intus hirsuto, lobis violaceis 6–7, lanceolatis 0·7–0·9 cm. longis et 0·5 cm. latis, apice acutis. *Stamina* 6–7, fauce inserta, filamentis 2 mm. longis ;

antherae lineari-oblongae, 4 mm. longae. *Ovarium* 4–5-loculare, stylo apice 5-lobato. *Fructus* caerulei, carnosi, calycis lobis persistentibus coronati, globosi vel ellipsoidei usque 2·3 cm. alti et 1·9 cm. diametro. *Semina* brunneo-aurantiaca, pyriformia, 0·7 cm. longa et 0·4 cm. lata, basi acuta.

TANGANYIKA. Eastern Province, Morogoro District, Uluguru Mts., near top of Bondwa Peak above Morningside, 2040 m., January 1953, *Eggeling* 6472 (EA, holo., K, iso.) :— shrub or small tree to 4·5 m. ; leaves large glossy above, very thick and tough, tending to roll backwards at the edges, dark green and shining above, pale green beneath ; flowers clustered ; calyx white tinged violet, about 1·4 cm. long (including lobes about 0·7 cm.) ; corolla waxy white with blue-violet lobes, tube about 1·6 cm. long, lobes about 0·7 cm. long ; fruit 4–5-locular, blue, nearly 2 cm. in diameter, topped by the persistent calyx (floral measurements are all from spirit material, EA.).

This very distinct species is quite different from any other African species and does not agree with anything described from the East. It brings the number of species of *Lasianthus* recorded from the montane areas of Tanganyika up to ten. The following key will help to distinguish these species, no fewer than nine of which occur or are endemic in the Ulugurus.

Key to the species of Lasianthus occurring in Tanganyika.

I. Inflorescences pedunculate :—

a. Leaves oblong or elliptic, hairy on nerves beneath, peduncle 1·5–2 cm. long, calyx denticulate . . *L. macrocalyx* K. Schum.

b. Leaves narrowly ovate, glabrous, peduncle 2–3 cm. long, calyx bilobate . . . . . *L. pedunculatus* E. A. Bruce

II. Inflorescences sessile :—

a. Flowers numerous, densely clustered :—

i. Ovary 6-locular, calyx glabrescent, corolla tube 1·2–1·4 cm. long . . . . . *L. cereiflorus* E. A. Bruce

ii. Ovary 5-locular, calyx glabrous, corolla tube 0·4–0·8 cm. long . . . . . *L. glomeruliflorus* K. Schum.

b. Flowers few together in the axils :—

i. Leaves papery or at the most subcoriaceous :—

★ Venation very closely reticulate, lateral nerves 9—10. Leaves mostly larger 9–17 × 2–6 cm.
L. kilimandscharicus K. Schum.

★ Venation noticeably more open, lateral nerves 7–9, leaves often small 3–9·5 × 0·8–3 cm.
L. sp. probably undescribed. W. Usambaras.

ii. Leaves thick and coriaceous :—

★ Mature leaves large 16 × 10·5 cm., very broadly truncate at the apex, corolla tube 1·6 cm. long, fruit about 2 cm. in diameter . . . . . *L. grandifolius* Verdcourt

★ Leaves narrower, acute or acuminate at the apex :—

- Leaves 8–17 cm. long and 3–8 cm. broad, lateral nerves 10–14 :—
  - × Calyx about 0·3 cm. long . *L. microcalyx* K. Schum.
  - × Calyx over 1 cm. long . *L. wallacei* E. A. Bruce
- Leaves 4·5–8 cm. long and 1·8–3 cm. broad, lateral nerves 5–6 . . . . *L. xanthospermus* K. Schum.

The other tropical African species, *L. sesseënsis*, M. R. F. Taylor (Uganda), *L. africana* Hiern and *L. batangensis* K. Schum. are very different from *L. grandifolius* Verdcourt. The very young leaves of *L. grandifolius* are acute but the point disappears and older leaves are often emarginate. The unnamed species from the W. Usambaras is represented by many sheets but is a species without any marked peculiarities. Under the circumstances it would be unwise to describe it without revising the genus. It is usually confused with *L. kilimandscharicus*. Since the above key was compiled a further unmatched species has been collected in the Uluguru and Nguru mountains. It is also resembles *L. kilimandscharicus* but has larger leaves 24 × 8·5 cm. and a longer corolla tube 8 mm. long instead of 4 mm.—*Paulo* 95 and 223 (EA).

Macrosphyra longistyla *Hook. f.* in Benth. and Hook. f., Gen. Pl. **2,** 86 (1873).

Randia longistyla DC., Prod. **4,** 388 (1830).

Gardenia paleacea A. Rich. in Mem. Soc. Hist. Nat. Paris, **5,** 241, 294 (1834).

Through the courtesy of the Curator of the Paris Herbarium I have been able to examine a photograph of the type of Richard's species (*Leprieur* s.n.). As suggested by Hiern (F.T.A. **3,** 105) the above synonymy is undoubtedly correct.

Otiophora pauciflora *Baker* var. **ovata** *Verdcourt* in J. Linn. Soc. Bot. **53,** 410 (July 1950).

O. perrieri Genissel-Homolle in Not. Syst. **14,** 74 (Feb. 1950).

When examining sheets of this genus on loan from the Paris Herbarium I noticed that several specimens of *O. pauciflora* had been annotated with the name "*perrieri*". After correspondence I understood that the name was not to be published. Whilst my revision was in the press, however, the name was published. I am still unable to agree that the specimens should constitute a new species. I am very grateful to Mr. Marshall of Kew for finding out the date of publication of the fascicle of Not. Syst. concerned.

Pamplethantha viridiflora (*Schweinf. ex Hiern*) *Brem.* in Engl., Bot. Jahrb. **71,** 217 (1940).

This tree is not recorded for Tanganyika in the Check List but occurs in the Bukoba area.

Tanganyika. Bukoba District, Munene, 1936, *Gillman* 614 (EA, K) :—small tree at rain forest edge on alluvial clay.

Pavetta corethrogyne *Brem.* in Kew Bull. **1949,** 350 (1949).

Since the holotype of this species (*Zimmermann* 1771, EA) is a poor scrappy unicate it is worth citing two other much better sheets which Dr. Bremekamp did not see because one had been placed in the wrong genus and the other was undistributed.

Tanganyika. W. Usambaras, Gare, 1850 m., 14 January 1941, *Greenway* 6109 (EA, K) : —a much-branched white-flowered shrub up to 2 m. tall, locally common on a bright red soil in secondary bush of *Rumex abyssinicus*, *Conyza*, *Synadenium*, and *Becium* on a steep mountain slope. Ditto, Schume–Mkumbara, 24 August 1909, *Braun* 2879 (EA).

SAPOTACEAE

Aningeria altissima (*A. Chev.*) *Aubr. et Pellegr.* in Bull. Soc. Bot. France, 1934, **81,** 796 (1935).

Tanganyika. Lake Province, S. Biharamulo District (on border of Kahama District) in riverine strip at Nyakanazi, 1200 m., July 1953, *Eggeling* 6639 (EA, K):—tree to 30 m., bole grey, shallowly corrugated, slash exudes a white latex, flower buds greenish, young foliage slightly yellow-red.

(N.B. Dr. Eggeling also saw this species in the Geita District).

This species is not unexpected in the Bukoba area which contains many species with centres of distribution in Uganda and further to the West e.g. *Strophanthus preussii.*

Manilkara dawei (*Stapf*) *Eggeling,* Indigenous Trees of Uganda, 226 (1940) ; Chiov. in Atti R. Accad. Ital. **11,** 46 in obs. (1940).

The record of this species from Iringa has been shown to rest on a misidentification. The species does, however, occur in Bukoba District.

Tanganyika. Bukoba District, Kiao Island, *Gillman* 390 (K, EA) :—large tree, frequent in forest on alluvial soil derived from shale.

THYMELAEACEAE

Dais cotinifolia *Linn.*, Spec. Pl. ed. 2, 556 (1762).

This is not recorded for Tanganyika in the Check List but several gatherings have been made in Sth. Tanganyika where it is undoubtedly wild.

Tanganyika. Southern Highlands Province, Ubena, Njombe District, Njombe–Uwemba road, Mpala Forest, 1830 m., May 1953, *Eggeling* 6549 (EA, K) :—small shrubby tree to 3·6 m., flowers rose-pink, fragrant. Iringa, 1936, *Emson* 524 (EA, K). Njombe District, vicinity of Mpala and Litoni Forest Reserves, 11 miles south of Njombe, 1650 m., 26 Jan. 1952, *Wigg* 1006 (EA) :—small tree to 7·5 m. tall but flowering profusely from 1 m. upwards, flowers pink, sweet-smelling, frequent in secondary bush of temperate rain forest type with *Agauria*, *Myrica*, *Dodonaea*, *Smithia*, *Buddleja*, almost dominant in some places, seen for about 10 miles north to 20 miles south of Njombe on the Iringa and Songea roads ; stated to yield fibre.

To end these notes a few of the more interesting plants collected by the Tanganyika forestry workers during 1954 are listed. To give details would involve too much space but specimens have been deposited at Kew.

Thunbergia stelligera Lindau, *Sclerochiton kirkii* (T. Anders.) C.B.Cl., *Maerua pygmaea* Gilg, *Thylachium alboviolaceum* Gilg, *Garcinia albersii* Engl., *Millettia goetzeana* Harms, *M. makondensis* Harms, *Platysepalum inopinatum* Harms, *Smithia princeana* Harms, *Faurea usambarensis* Engl., *Lasiodiscus usambarensis* Engl., *Ixora albersii* K. Schum., *Triainolepis africana* Hook. f.,

Lasianthus microcalyx K. Schum., *L. macrocalyx* K. Schum., *Fagara braunii* Engl., *Pancovia holtzii* Gilg ex Radlk., *Rinorea subumbellulata* M. Brandt, *R. ferruginea* Engl., *Cissus bussei* Gilg et Brandt, *Crossandra jashi* Lindau, *Barleria fulvostellata* C.B.Cl.

Corrections to Notes from E.A. Herbarium : I (Kew Bull. 353–365, 1952).

p. 361 for *Pentis* on line 2 read *Pentas*.

p. 362 for 1904 following citation of *P. homblei* read 1914.

RADYERA *nom. nov.*

A. A. Bullock

In 1944 Dr. E. P. Phillips gave good reasons for describing a new monotypic genus of *Malvaceae* which he named *Allenia* in honour of his successor as Chief of the Division of Botany, Pretoria, Dr. Robert Allen Dyer. The new genus was based upon *Hibiscus urens* Linn. f., but unfortunately Dr. Phillips overlooked the valid publication in 1909 of *Allenia* Ewart,* a monotypic euphorbiaceous genus from Australia, and it therefore requires a new name. I propose to maintain the association of this plant with Dr. Dyer.

Radyera *Bullock*, nom. nov.

Allenia Phillips in Journ. S. Afr. Bot. **10,** 33 (1944), et Gen. S. Afr. Fl. Pl. ed. 2, 500 (1951) ; non Ewart in Proc. Roy. Soc. Victoria, n.s. **22,** 7 (1909).

R. urens (*Linn. f.*) *Bullock*, comb. nov.

Hibiscus urens Linn. f. Suppl. Pl. 309 (1781) ; Harvey in Harvey et Sonder, Fl. Cap. **1,** 172 (1860).

H. cucurbitinus Burch. Trav. **1,** 278 (1822).

Allenia urens (Linn. f.) Phillips, *ll. cc.*

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* The genus was based upon *Micrantheum demissum* F. Mueller and the specific name *Allenia blackiana* Ewart is therefore illegitimate.—A.A.B.

NOTES ON AFRICAN GRASSES : *XXIV.

Richardsiella, a new genus of grasses from Tropical Africa.

Joan Elffers and J. Kennedy-O'Byrne

Tropical Africa is exceptionally rich in grasses, not only in the vast numbers of individual plants forming its extensive grasslands but especially in the number of genera and species and in the diversity of the tribes represented.

The larger and more conspicuous common grasses, especially the perennial species, are generally well-known but the smaller grasses, particularly the annuals, have received far less attention. This is partly due to their limited agricultural value but mainly because of their short duration and insignificance ; consequently, they have been overlooked by all but the more methodical and observant collectors.

In south-east tropical Africa, notably on shallow soil overlying rock, many new annual species have been discovered in recent years. One of these is so distinct that it merits recognition as a new genus. It has been named in honour of its discoverer, Mrs. H. M. Richards, who has been actively collecting for Kew in Northern Rhodesia in recent years.

The specific epithet describes the caterpillar-like appearance of the spikes on the main axis of the inflorescence.

Richardsiella *Elffers et Kennedy-O'Byrne*, genus novum, in tribum *Eragrosteas* ponendum, sed egregium neque generi alii ulli cognito obvie affine, ob spicas breves conspicue secundas dense spiculatas solitarias alternas distichas in inflorescentia angusta laxa elongata dispositas, axem primarium et rhachidem spicarum seta gracillima nuda terminatum, spiculas subsessiles demum horizontaliter patentes 6 -12-floras, glumas et lemmata membranacea 1-nervia, lemmata obtusa vel leviter emarginata ciliata apice apiculata vel mucronulata, paleas carinis ciliatas, stamina 2 distinguendum.

Spiculae ambitu ovato-oblongae, late elliptico-oblongae, vel oblongae, lateraliter compressae, parvae, contiguae, biseriatae, alternae, demum horizontaliter patentes, in rhachide gracili spicarum brevium secundarum subsessiles ; rhachis seta brevi terminata ; spicae solitariae, alternae, distichae, a se plus minusve aequaliter distantes, secus axim primarium inflorescentiae laxe dispositae ; axis primarius seta longiuscula gracili terminatus ; rhachilla supra glumas et inter anthoecia demum disarticulans, internodiis brevissimis glabris gracillimis. *Anthoecia* 6–12, ♂, vel summum sterile et plus minusve redactum. *Glumae* persistentes, a latere visae anguste lanceolatae vel lanceolatae et acute acuminatae vel caudato-acuminatae, leviter carinatae, membranaceae, 1-nerves, inaequales ; inferior adaxialis, spicula brevior ; superior spiculam circiter aequans. *Lemmata* arcte imbricata, leviter carinata vel inferne dorso rotundata, a latere visa lanceolato-oblonga vel anguste ovato-oblonga, obtusa, integra vel leviter emarginata, membranacea, 1-nervia, apiculata vel nervo in mucronem brevissimum producto, marginibus ciliata. *Paleae* lemmatibus subaequales, oblongae, truncatae, dorso convexae et basin versus leviter gibbosae, membranaceae, bicarinatae, carinis demum

* Continued from Kew Bull. 1949 : 376 (1949).

rigidis ciliatis, marginibus inflexis. *Lodiculae* minutissimae vel nullae. *Stamina* 2 ; antherae oblongae. *Ovarium* glabrum ; styli terminales, distincti ; stigmata breviter plumosa. *Fructus* ellipsoideus vel leviter obovoideus, teres, laevis, durus, inter lemma paleamque laxe inclusus ; pericarpium liberum, delicatum ; embryo circiter dimidiam partem fructus aequans ; hilum punctiforme, subbasale.

Gramen annuum humile ; culmi solitarii vel fasciculati, erecti gracillimi, paucinodes, supra basin simplices ; ligulae ad seriem ciliorum redactae ; laminae anguste lineares, tenuiter acutae ; inflorescentiae erectae, angustae ; spicae densissime spiculatae, primo strictae, demum incurvae.

Species unica, Africae tropicae austro-orientalis incola.

Richardsiella *Elffers et Kennedy-O'Byrne*, genus novum.

Spikelets ovate-oblong to broadly elliptic-oblong or oblong, laterally compressed, small, contiguous, biseriate, alternate, spreading at right angles from and subsessile on one side of the slender continuous rhachis of short racemosely and distichously arranged spikes, the rhachis terminating in a short naked bristle, the spikes solitary, alternate, more or less evenly spaced on the main-axis which terminates in a longer naked bristle; rhachilla readily disarticulating above the upper glume and beneath each floret, the internodes extremely short, slender, glabrous. *Florets* 6–12, hermaphrodite, or the uppermost more or less reduced ; callus glabrous, truncate, minute. *Glumes* persistent, narrowly lanceolate to lanceolate and acutely acuminate to aristate-acuminate or caudate-acuminate in profile, slightly keeled, membranous, 1-nerved, unequal, the lower about two-thirds the length of the spikelet, the upper longer and equalling or slightly exceeding the spikelet, with a few stiff spreading tubercle-based hairs on the keel. *Lemmas* closely imbricate, slightly keeled, or rounded on the back only in the lower part, narrowly ovate-oblong or lanceolate-oblong and obtuse in profile, entire or shallowly emarginate, apiculate or shortly mucronate from the tip, membranous, hyaline, 1-nerved, ciliate on the margins. *Paleas* about as long as or slightly longer than the lemmas, oblong, truncate, dorsally convex and gibbous towards the base in profile, membranous, hyaline, 2-keeled with keels spaced and ciliate, becoming rigid with sharply inflexed margins. *Lodicules* minute or 0. *Stamens* 2 ; anthers broadly oblong. *Ovary* glabrous ; styles terminal, distinct, very slender ; stigmas shortly plumose. *Caryopsis* ellipsoid or slightly obovoid, terete in transverse section, hard, smooth, free between the lemma and the palea, with a very thin free pericarp ; embryo nearly half the length of the caryopsis ; hilum small, subbasal, punctiform.

Low annuals ; culms solitary or in small fascicles, erect, very slender, few-noded ; ligule a densely ciliate rim ; blades narrowly linear, finely acute ; inflorescence erect, narrow ; spikes densely spiculate, few to many, at first straight, becoming incurved, as long as or shorter than the internodes of the rhachis ; spikelets each with a minute bristly hairy basal callus.

Richardsiella eruciformis *Elffers et Kennedy-O'Byrne*, species nova.

Gramen 7–18 cm. altum. *Culmi* erecti, tenuiter filiformes, teretes, rigidiusculi, prope basin 1–3-nodes, simplices et solitarii vel basi ramosi et fasciculati, glabri, inflorescentiam versus minute et obscure scaberuli,

ceterum laeves, internodio supremo e vagina superiore demum longe exserto. *Folia* pilis brevibus patentibus nonnúnquam e tuberculis minutis ortis laxissime vel sparsissime pilosa vel fere glabra ; vaginae dorso rotundae, imbricatae, tenuiter striatae, ore pilis albis mollibus barbatae, superiores arcte appressae ; ligulae ad seriem densam ciliorum usque 1 mm. longorum redactae ; laminae anguste lineares, in acumen tenue attenuatae, 1–6·5 cm. longae, planae et usque 1·5 mm. latae vel siccitate involutae vel convolutae, rigidiusculae, superne arcte nervatae, nervis minutissime et dense hispidulae vel scabrae, marginibus et subtus apicem versus scaberulae. *Inflorescentiae* erectae, late lineares vel lanceolato-lineares, strictae, 1·5–7 cm. longae, 4–8 mm. latae, laxae, cinerascentes vel purpurascentes ; axis primarius strictus gracilis, plus minusve quadrangularis, leviter compressus, angulis minute scaberulus, supra spicam terminalem in setam tenuem strictam vel leviter flexuosam angularem scaberulam plerumque 1–3 cm. longam productus. *Spicae* erectae vel adscendentes, 3–11 (raro 1–2), conspicue secundae, 5–12 mm. longae, demum incurvatae, densissime spiculatae, a se spatio longitudinem suam subaequante usque 12 mm. distantes ; rhachis dorso plana vel leviter convexa, usque 0·3 mm. lata, marginibus scaberula, basi setosa, supra spiculam terminalem in setam tenuissimam scaberulam 1–4 mm. longam producta. *Spiculae* 1·6–2 mm. longae, usque 1·5 mm. latae, 6–12-florae, hirsutae ; callus basalis pilis albis usque 1·5 mm. longis setosus. *Glumae* explanatae lanceolatae vel anguste ovatae, tenuiter acute acuminatae, superne leviter scaberulae ; inferior 1·2–2 mm. longa, marginibus sparse ciliolata ; superior 1·5–2·5 mm. longa, carina circa et supra medium pilis patulis paucis e tuberculis ortis setosa. *Lemmata* explanata elliptica et obtusa vel leviter emarginata, 1–1·3 mm. longa, minute apiculata vel nervo in mucronem usque 0·2 mm. longum producto, carinis leviter scaberula, marginibus pilis albis patulis ciliata. *Paleae* carinis pilis patulis albis ciliatae. *Antherae* 0·25–0·3 mm. longae. *Fructus* pallidus, 0·3–0·4 mm. longus.

Richardsiella eruciformis *Elffers et Kennedy-O'Byrne*, species nova.

A low delicate annual, 7–18 cm. high. *Culms* solitary or in small tufts, erect, stiff, simple above the base, finely filiform, terete, 0·2–0·5 mm. wide and 1–2-noded near the base, finely striate, glabrous, minutely scaberulous towards the inflorescence, otherwise smooth, with the uppermost internode finally long-exserted from the leaf-sheath. *Leaves* thinly to sparsely pilose with short somewhat stiff spreading hairs, these sometimes arising from minute tubercles ; sheaths rounded on the back, finely striate, bearded at the mouth with soft white hairs, the basal spreading, the upper tightly enclosing the culm ; ligule represented by a densely ciliate rim of stiff white hairs up to 1·0 mm. long, and with lateral tufts up to 2·5 mm. long ; blades narrowly linear, finely acute, 1·0–6·5 cm. long, flat and up to 1·5 mm. wide, or involute or convolute when dry, closely nerved above, with the nerves very minutely and densely hispid or scabrid, scaberulous on the margins and also beneath towards the apex. *Inflorescence* erect, broadly linear to lanceolate-linear, straight, up to 7·0 cm. long and 4–8 mm. wide, purplish or greyish ; primary axis straight, slightly compressed, flattened back and front and hence more or less quadrangular, minutely scaberulous on the angles, produced beyond

FIG. 1. A, plant × 1 ; B, junction of sheath and blade to show ligule, × 25 ; C, spikelet, × 25 ; D, lower glume × 25 ; E, upper glume, × 25 ; F, lemma, × 30 ; G, palea × 25 ; H, palea in side view, and stamens, × 25 ; I, pistil, × 30 ; J, grain, × 50.

the terminal spike into a distinct bare angular scaberulous bristle up to 3·0 cm. long. *Spikes* erect or ascending, 3–11 (rarely 1–2), conspicuously secund, about their own length or less apart, markedly incurved on the adaxial side, distichously arranged on the primary axis in the form of a sinusoid curve, 5–12 mm. long, very dense ; rhachis with a bristly hairy pulvinus at the base, dorsally flattened or slightly convex on the back, up to 0·3 mm. wide, scaberulous along the margins, terminated by a fine bare scaberulous bristle 1–4 mm. long. *Spikelets* 1·6–2 mm. long, about 1·5 mm. wide, closely 6–12-flowered, hairy ; basal callus bearing stiff white hairs up to 1·5 mm. long. *Glumes* lanceolate to narrowly ovate and finely acutely acuminate when opened out, tinged with purple, slightly scaberulous upwards ; lower 1·2–1·4 mm. long (including the 0·4 mm. aristiform apex), with a few very short cilia on the margins and occasionally bearing on the midrib a stiff tubercle-based hair ; upper 1·5–2 mm. long (excluding the –0·75 mm. aristiform apex), with very short cilia along the margins, bearing in the upper half along the midrib several prominent stiff spreading tubercle-based hairs up to 0·8 mm. long. *Lemmas* elliptic to ovate and obtuse when opened out, 1–1·3 mm. long, with a mucro up to 0·2 mm. long or only very minutely apiculate, ciliate with stiff white spreading hairs on the margins. *Paleas* up to 1·25 mm. long, stiffly ciliate on the keels. *Anthers* 0·25–0·4 mm. long. *Caryopsis* 0·3–0·4 mm. long, pale.

Northern Rhodesia : Abercorn District ; Chilongowelo, in sandy soil on open path close to Plain of Death, 4,800 ft., 2.4.1952, *Richards* 1309 ; ibid., 9.4.1955, *Richards* 5380 (typus).

Morphology. As one might well expect in such a delicate plant in which space for the development of the inflorescence in the leaf-sheath is of necessity very limited, there is considerable evidence of reduction :—

(1) the main and lateral axes terminate in sterile bristles.
(2) there is a general thinning in the tissues of the glumes and lemmas.
(3) the nerves in the lemma are reduced to the midrib.
(4) the number of stamens is reduced to two in each flower.

Unexpectedly, the tightly packed spikelets on the lateral branches do not show reduction in their floret numbers, which is usually found in inflorescences of this type.

Classification. Although this remarkable monotypic genus must be classified among the genera of the *Eragrosteae–Chlorideae* complex, judging from its morphology it is not closely related to any of them. It is immediately separable from genera comprising the true *Chlorideae* as defined by C. E. Hubbard in Hook. Ic. Pl. xxxiv. t. 3319 (1936) and Hutchinson and Dalziel in Fl. W. Trop. Afr. 2 : 496 (1932) by its 6–12-flowered spikelets. Superficially, in the character of the sterile tips of the primary and lateral axes and its dense secund 2-ranked spikes, it seems to have some affinity with *Dactyloctenium* Willd. but differs from this genus in having a smooth caryopsis, a racemose inflorescence of spikes, and thinner lemmas.

Richardsiella may well be more closely related to certain of the *Eragrosteae*, in particular to *Eragrostis hispida* K. Schum. and its allies. With these species it has in common the several-flowered spikelet, shape and hairiness of the palea and lemma, a smooth grain and the prolongation of the primary and lateral axes into fine bristles. The chief difference lies in

the inflorescence of *Richardsiella* which cannot be accommodated within the loose or contracted panicles of the *Eragrosteae*.

Perhaps the most significant diagnostic feature of the new genus is the presence of a single median nerve in the lemma, which serves to place it apart from the typical genera of the *Chlorideae* and *Eragrosteae* (where the lemma is usually distinctly 3-nerved).

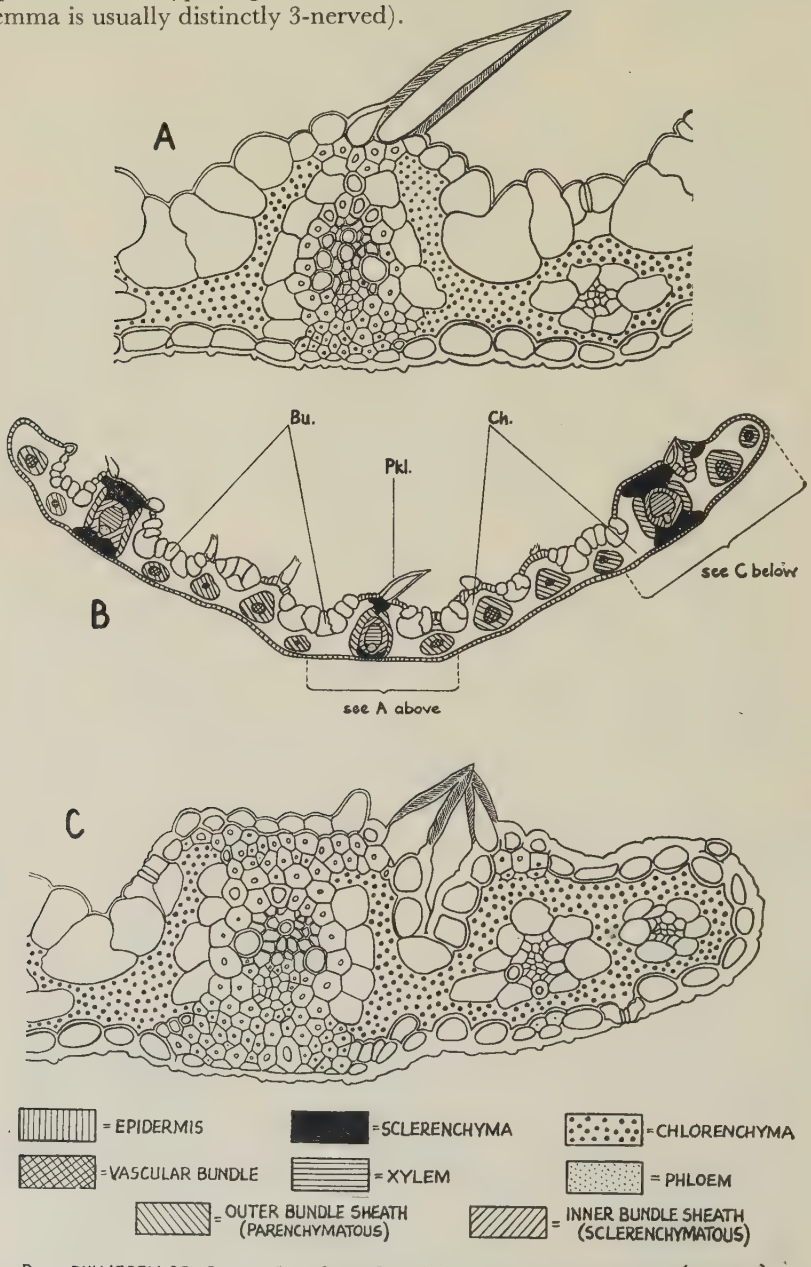

FIG. 2. A & C, transverse sections through midrib and marginal portion of leaf-blade illustrating details of cell-structure, × 225 ; B, transverse section through leaf-blade showing the distribution of tissues, × 75.

Dispersal and Distribution. On preliminary examination, *Richardsiella* would seem to possess dispersal devices ideally suited for a wide distribution of its seed. The margins of the lemma and the keels of the palea are provided with stiff spreading hairs such as are found in the false fruits of *Eragrostis hispida* K. Schum., a grass widely distributed from Kenya to Angola. The production of seed is prolific (a rough estimate gives 700 seeds to a fairly robust plant), due to the large number of florets per spikelet and the crowding of spikelets on the rhachis. In spite of these advantages, however, *Richardsiella* seems to occur very locally and is relatively rare. This is perhaps due to the lemma fracturing at the base at maturity, so that the grain is set free locally and does not, in fact, form a false fruit with the hairy lemma and palea, and also to the exceptional habitat requirements. Its many xeromorphic characters suggest that this plant may be a fleeting annual that germinates, develops and produces seed all in the space of a few weeks after rain, and that it flourishes where relatively few plants can survive.

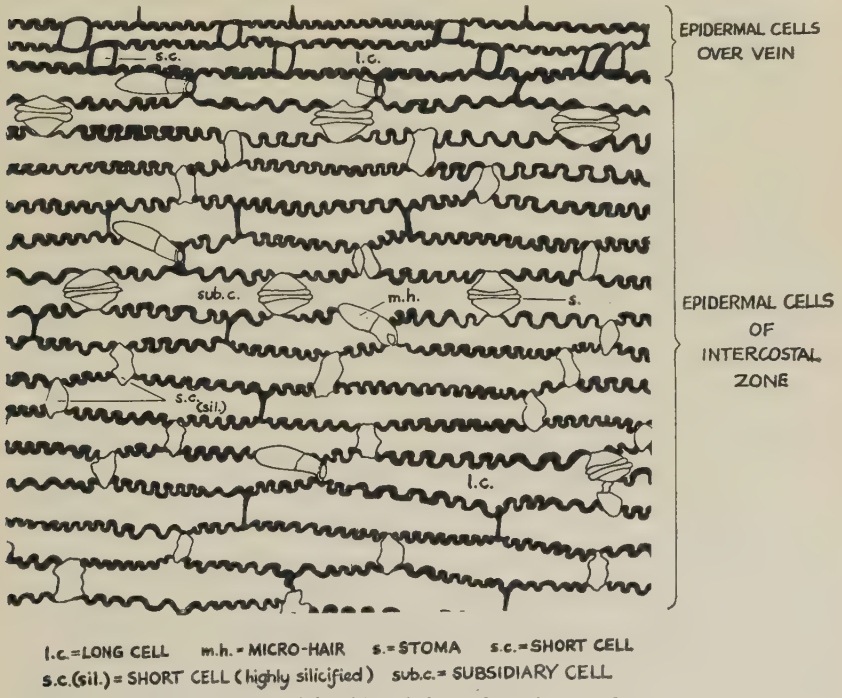

Fig. 3. Abaxial epidermis in surface view, × 225.

Anatomy. This anatomical study is based on examination of the stripped abaxial epidermis and transverse sections cut from the middle third of the leaf-blade taken from dried herbarium material.

Epidermis : The abaxial epidermis as seen in surface view with the long axis of the leaf horizontal (fig. 3) is composed of longitudinal files of long cells, contiguous though usually alternating with paired or solitary short cells which, in the intercostal region, are sometimes replaced by stomata, micro-hairs or long unicellular hairs. The long cells have thickly cuticularised, sinuous, anticlinal (ribbon) walls and, in the region over the

veins, are narrower and more precisely rectangular than those in the intercostal region. The short cells over the veins, situated in every or in alternate files, are usually paired, thick walled, cuboid in shape, containing conspicuous silica bodies that are similar in outline whereas, in the intercostal region, the short cells are usually solitary, thin walled, more or less oblong, transverse to the main axis, containing silica bodies which are concave on one or both sides and present in nearly every file of long cells. The stomata which are bounded by triangular subsidiary cells, frequently alternate with the long cells in the intercostal region and occur in every fifth or sixth row. Micro-hairs (2-celled hairs) occur irregularly but quite frequently in the intercostal region, narrowly elliptic-oblong or oblong in outline, up to 0·275 mm. long with the distal cell broadly rounded at the tip and approximately equal in length to the basal cell. Unicellular hairs arising from a sunken base and up to 20 mm. long also occur irregularly and infrequently in the intercostal region.

Transverse Section : The transverse section (fig. 2) shows well-developed vascular bundles at the midrib and towards the margins of the blade with distinct xylem, phloem, inner (sclerenchymatous) and outer (parenchymatous) bundle sheaths and adjacent sclerenchyma. The secondary vascular bundles which alternate with each group of bulliform cells, show well-defined outer bundle sheaths with some sign of a lignified xylem region and a non-lignified region corresponding to phloem. The tertiary vascular bundles situated below the groups of bulliform cells show only a well-defined outer bundle sheath enclosing a mass of cells which, in the dried material examined, had thin and collapsed walls. The chlorenchyma of the mesophyll was seen, in the dried material examined, to consist of collapsed and ill-defined cells which were difficult to distinguish exactly but were probably of the oblong parenchymatous type. For this reason, this tissue is represented in figs. 2A and 2C in diagrammatic form by large dots. The epidermis of the upper and lower surfaces is thickly cuticularised, except over the groups of bulliform cells where it is only thinly cuticularised; and bears, in the thickly cuticularised parts on the upper surface, short simple sharply pointed hairs often referred to as prickles or aiguillons. The prickles give the upper surface of the leaf, as seen by the naked eye, its minutely and densely hispid or scabrid appearance (fig. 1B).

From the anatomical point of view, the form and arrangement of the epidermal cells in the leaf-blade are basically similar to those of certain genera referred to the *Chlorideae* and *Eragrosteae*, especially in the shape of the short cells and the presence of 2-celled micro-hairs. The transverse section of the leaf-blade shows a close similarity to that of the genus *Chloris* (*Chlorideae*), the pattern of the tissues being, in particular, almost identical with that described and illustrated for *Chloris pycnothrix* Trin. by B. S. Fisher in her study of certain Natal grasses in Ann. Natal Mus. 9 : 262 (1939).

Summary

Richardsiella is a new monotypic genus of the *Gramineae* from Northern Rhodesia, occupying an isolated position among the genera of the *Chlorideae* and *Eragrosteae*, and an example of the several apparently relict genera known from South Tropical Africa.

BOTANICAL RESULTS OF THE BANANA COLLECTING EXPEDITION, 1954-5.

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I. *Introduction*

A general report of the expedition, of which the botanical results form the subject matter of this paper, has been given elsewhere (Trop. Agriculture, Trinidad, in press). Results are set out in taxonomic order and, though they are mainly founded on my own observations and collections, I have taken the opportunity to cite some collections from the herbaria and to discuss certain related problems from the literature. Collections were made at low altitude unless otherwise stated. *Musa* alone is treated here ; discussion of *Ensete* must be deferred until a later date.

Each collection made in the course of the expedition was assigned a B.E. (Banana Expedition) number. No dried specimens were made ; instead, notes and photographs were taken and representative floral parts were collected in spirit in polythene bags. The spirit collections were assembled in Trinidad, transferred to jars and have been lodged at Kew, along with sets of photographs, drawings, museum seed samples, etc. The material collected is indicated thus :—S—seeds to grow at I.C.T.A., mostly with duplicates for the museum ; M—spirit collections ; P—photographs ; D—drawings. Duplicates of materials of local interest have been lodged in the herbaria at Lae, Singapore and Calcutta.

II. *Botany*

A. **Musa** section **Musa***

1. **Musa acuminata** *Colla* subsp. **banksii** (*F. Muell.*) *Simmonds*, stat. nov.

M. banksii F. v. Mueller, Fragm., **4,** 132 (1863–4).

M. paradisiaca subsp. *seminifera* (Lour.) Baker of Christophersen, Flrg Pls of Samoa, B.P. Bishop Mus. Bull., **128,** 54 (1935).

M. banksii var. *muelleriana* Domin, Bibl. Bot., **85,** 1 (2), 253 (1915).

Banana Expedition records :

Samoa :—valley south of Apia, Upolu, 1200 ft. (B.E. 1, 29.9.54, S) ; cross-island road, Upolu (B.E. 1b, 30.9.54, M) ; Patameo, Savaii, 1000 ft. (B.E. 2, 5.10.54, S) ; Sapapalii, Savaii, 1000 ft. (B.E. 3, 6.10.54, S) ; above Vailima, Upolu, 1000 ft. (B.E. 4, 10.10.54) ; above Falefa, Upolu, 1500 ft. (B.E. 5, 12.10.54, S).

Queensland :—Kuranda road near Cairns, 1000 ft. (B.E. 6, 6.11.54, DS) ; Liverpool Creek, 15 mi. south of Innisfail (B.E. 7, 10.11.54, S) ; Clump Point near El Arish (B.E. 8, 10.11.54, S) ; Palmerston Highway area 10 mi. west of Innisfail, 1000 ft. (B.E. 9, 12.11.54, S) ; Cooktown–Daintree River area (14.11.54, D).

New Guinea :—Dagua near Wewak (B.E. 14, 7.12.54, DM ; and B.E. 15, 7.12.54, M) ; Bainyik, northern Sepik area (B.E. 16, 8.12.54, M) ; Ambunti, central Sepik (B.E. 21, 22, 24, 10.12.54, SMP) ; Madang-Gogol valley foot (B.E. 32, 16.12.54, SMP) ; Baiyer River valley, Western Highlands, 4000 ft. (B.E. 33, 19.12.54, SMP ; B.E. 34,

* Following Art. 32 of the Code ; but to avoid confusion I continue to use the name *Eumusa* informally.

35, 36, 19.12.54, S) ; lower Markham River valley (B.E. 45, 28.12.54, MS) ; Wompit, Snake and Bulolo River valleys and Wau Gorge up to 3000 ft. (28–30.12.54) ; Lae area (2.1.55).

Papua :—Middletown, Kikori River, Gulf of Papua (B.E. 50, 16.1.55, MP ; B.E. 51, 16.1.55, MS).

Other Records :—

Queensland :—Bellenden Ker (*C. T. White* 1303, March 1922, in Herb. Sydney and Herb. Brisbane) ; Palm Island (specimen in Queensland Univ. Bot. Mus.) ; rain forest between E. Palmerston and Millaa Millaa (*Flecker* 5008, 23.6.38 in Herb. Brisbane) ; Mount Eliot (*Fitzalan* in Herb. Melbourne, the TYPE of *M. banksii* F. Muell. and the most southerly known locality for any wild banana) ; Daintree River (*Fitzalan*, Oct. 1875 in Herb. Melbourne, a small fruited form, the TYPE of the worthless variety *muelleriana* Domin—" baccis quam in typo subduplo minoribus ") ; a specimen of a plant cultivated at Melbourne (*F. v. Mueller*, in Herb. Melb., evidently the material on which Bentham described female flowers in the Flora Australiensis) ; Endeavour River near Cooktown (*Persieh* 443, June 1882, in Herb. Melb., a male bud only).

New Guinea :—Garaina, Morobe District (native collector, New Guinea Forest Department Herbarium (N.G.F.) 6955, January 1955 ; also N.G.F. 6964, alt. ca. 4500 ft., March 1955).

Vernacular names :

Samoa :—*Fa'i taemanu* (" Wild banana "—Samoan).

New Guinea :—*Waniga* (generic name for wild bananas—Dagua area) ; *Kusu labu* (Timbunki language at Ambunti, Sepik).

Remarks :

Experiment and field observation agree in indicating that *M. banksii* should be reduced under *M. acuminata* (cf. Cheesman in *Kew Bull.*, **1948,** 157). The considerations which prompted the choice of subspecific rank and remarks on geographical distribution are set forth below. The diagnostic features of the subspecies are : the predominantly brown pseudostems ; the slight development of wax on the leaves ; the male fertility of the female flowers ; the large bunches of large, sometimes more or less ageotropic, fruits ; the fruits long-pedicellate and obtuse or very shortly acuminate ; and the non-imbricate male buds with bracts often yellow. About a score of inflorescences in the female phase were examined in Samoa, Queensland and New Guinea ; all flowers showed some degree of male fertility which varied with the position in the inflorescence, thus, for example :—

	Functional stamens per female flower in:	
	Basal hands	Upper hands
Samoa, B.E. 1b	2–3	5
Samoa, B.E. 5	1–2	4–5
Queensland, Daintree River ...	1–2	4–5
New Guinea, B.E. 14 ...	2–3	5

The two adaxial stamens are the first to develop, followed usually by the median abaxial one. The tendency to ageotropism of the fruits leads, in the extreme, to very awkwardly shaped bunches of splayed fruits, well shown in photographs of B.E. 5, 9, 14 and 21, for example : in other collections (e.g. B.E. 32 from Madang, New Guinea) there was less irregularity and in others still (e.g. B.E. 33 36 from the Baiyer River, New Guinea) there was none. The large fruit characteristic of the subspecies results from a large seed content which itself results from a high ovule number. For comparison with the following figures it may be

noted that the ovaries of *Musa acuminata* from the lowlands of Malaya and Thailand contain about 120 ovules which set 40–50 seeds :—

Samoa :—B.E. 1—380 ovules per ovary ; B.E. 3—340.

Queensland :—B.E. 6—170 seeds per fruit.

New Guinea :—B.E. 14—300 ovules per ovary ; B.E. 16—400 ; B.E. 32—320 ; B.E. 33—310 ovules, 250 seeds ; B.E. 50—360 ovules.

The ovules, as always in *M. acuminata*, are two-rowed in each loculus but, by crowding, sometimes seem to be irregularly four-rowed ; the placentae however are constantly double, not quadruple as in some other Eumusas.

The slender pedicel and obsolescent acumen of the fruit was also somewhat inconstant ; thus B.E. 45 from the lower Markham River valley had short pedicels and pronounced acumens though in other characters it agreed with *banksii*.

Bract colour was variable but can at least be said to be more frequently yellow than in any other form of *M. acuminata*. All Samoan plants examined had bracts of a dirty brownish red (*M. banksii* var. *samoensis* Cheesman *Kew Bull.*, loc. cit.) ; in nearly all Queensland plants they were yellow but one group at Clump Point (B.E. 8) was a mixture of red- and yellow-bracted types ; in New Guinea variability was the rule and the red colours (e.g. near Madang) were sometimes brighter than in, say, the Samoan plants.

It is possible that some at least of the New Guinea populations were introgressed by a different form of *M. acuminata* coming from the west. Thus some of the collections cited above may be of hybrid origin and this would account for the occurrence of shortly pedicellate and acuminate fruits, bright red bracts and so forth. Unfortunately we do not know what forms of *M. acuminata* occur in Dutch New Guinea and eastern Indonesia where the solution to the problem lies.

From the banana breeding viewpoint these banksiis are of the utmost importance and collections from Samoa, and from Ambunti, Madang and the Baiyer River in New Guinea are now being grown for this purpose at the Imperial College of Tropical Agriculture. They all have high ovule numbers (and, therefore, large fruits) and large bunches ; the Baiyer River collections were outstanding for the size and elegance of their bunches. They have yet to be tested for disease resistance but, if satisfactory in this respect, are superficially the most promising materials the banana breeder has ever had.

Musa banksii var. *singampatti* Nayar (Ind. Journ. Hort., **9,** 13 (1952)) was described as a variety of this species because it had hermaphrodite basal flowers ; there the resemblance ends however and in its non-waxiness, its black pseudostem pigmentation, its angular subsessile and acuminate fruits, its large seeds, its dark violet bracts and in its geographical distribution it is quite different from the subspecies *banksii* as typified by Fitzalan's Queensland plant. It agrees with the Ceylon form of *Musa acuminata* mentioned by Chandraratna (Ind. J. Gen. Pl. Br. **11,** 31 (1951)) in most characters described (though the latter author unfortunately does not describe the basal flowers) and it therefore looks as though there is a distinct subspecies of *Musa acuminata* in southern India

and Ceylon, one which offers an interesting parallel to the subspecies *banksii* at the other end of the range.

2. **Musa acuminata** *Colla* subsp. **malaccensis** (*Ridl.*) *Simmonds*, stat. nov.

M. malaccensis Ridley, Trans. Linn. Soc. Ser. 2, **3,** 385 (1893).

M. acuminata Colla, the Selangor form, Cheesman, Kew Bull. 1948, 17 et seq. ; Simmonds, Malayan Nat. J. **10,** 3 (1955).

M. flava Ridl. loc. cit. ; Simmonds, Ann. Bot. Lond. **18,** 478 (1954).

Banana Expedition Records :—

Malaya :—Ulu Langat near Kuala Lumpur, Selangor (B.E. 55, 10.2.55, SMP) ; noted also (but no collections made) at Ginting Sempak, on both the Selangor and Pahang sides ; valley above Tapah, Perak ; Ulu Kinta, Perak ; north of Kuala Kangsar and at Sungei Rui near Grik, Perak ; and on the Seremban–Kuala Pilah road, Negri Sembilan.

Other Records :—

Malaya :—Tanjong Gajah Mati, Pahang (*Ridley s.n., ann.* 1894, in Herb. Singapore, the TYPE of *M. malaccensis* Ridl.) ; Bentong–Kuala Lipis road, Pahang (I.C.T.A. Introduction 296).

Vernacular names :—

Malaya :—*Pisang utan* ("jungle banana", a generic name, Malay) ; *Pisang kerok* (Malay, fide Cheesman loc. cit. ; this name is also applied to *M. violascens*, q.v.) ; *Pisang surong* (Malay, fide Ridley on type collection).

Remarks :

This, the subspecies characteristic of the lowlands of central Malaya, is a slender plant usually strongly waxy, with midribs commonly (but not always) bright red beneath, with a horizontal bunch and bright red non-imbricate male bracts. It is replaced in northern Malaya (i.e. in Kedah, Perlis and Kelantan) by the following subspecies ; it is common in western Pahang but its distribution in other parts of that State is unknown ; I know no record of it (or, curiously, of any other form of the species) for Johore. If investigation should show that the same subspecies is characteristic of the lowlands of Java then the name *zebrina* van Houtte would have to be used as having priority over *malaccensis*. *Musa flava* Ridl. is merely a yellow bracted mutant of the subspecies which has been recorded from Ulu Langat, Selangor (I.C.T.A. Introduction No. 269), from Pulau Tijau, Pahang (Ridley loc. cit.) and from Pekan, Pahang (*Milsum* s.n., March 1934, in Herb. Calcutta).

Comments on hybridization between this and other subspecies are made below.

3. **Musa acuminata** *Colla* subsp. **siamea** *Simmonds*, subsp. nov.

M. acuminata Colla, the Annam form, of Cheesman, Kew Bull. **1948,** 27.

M. acuminata Colla, the Kedah form, of Simmonds, Malayan Nat. J. **10,** 3 (1955).

M. acuminatae Colla subsp. *malaccensi* affinis, habitu plerumque minore, colore brunneo minus evoluto, bracteis alabastri masculi imbricatis pallide purpureis flavo-virgatis differt, praterea regionum diversarum incola.

Banana Expedition Records :—

Malaya :—Batu Mpat and Durian Buring, east of Gurum, Kedah (B.E. 65, 27.2.55, MPS) ; Gurum area, Kedah (B.E. 66, 28.2.55, S) ; Padang Terap, Sintok, and Bukit Tunjang, Kedah (1–3.3.55, no collections) ; Bukit Lagi (also Bukit Chuping and Bukit Ketri), Perlis (B.E. 67, 4.3.55, M) ; Kaki Bukit and Bukit Temiang, Perlis (5.3.55, no collections) ; Tanah Merah, Kelantan (B.E. 68, 6.3.55, M) ; Manek Urai, Kelantan (B.E. 69, 7.3.55, S).

Thailand :—east side of Doi Chiengdao, near Chiengmai, 2000 ft. (B.E. 71, 1.4.55, MPS) ; Banphasing, north of Nan, 600 ft. (B.E. 76, 5.4.55, MPS) ; Pangtonpheung, north of Uttaradit (no collections, 7.4.55, P).

Other Records :—

Thailand :—Doi Pepo, 800 m. alt. (*Kerr* 6183, 29.6.1922, in Herb. Mus. Brit.) ; Betong, Patani (*Kerr* 7482, 3.8.1923, in Herb. Mus. Brit.) ; locality unspecified (I.C.T.A. Intro. 403, now maintained as the clone Siam, the TYPE of subsp. *siamea*, specimens in Herb. Kew.).

Indochina : locality unspecified (I.C.T.A. Introduction 144, the " Annam form " of Cheesman loc. cit.).

Vernacular Names :—

Malaya :—*Pisang utan* (" jungle banana ", Malay, a generic name).

Thailand : *Klue pa* (" wild banana ", Thai, a generic name) ; *Klue ling* (" monkey banana ", Thai, a generic name noted near Uttaradit) ; *Klue mon* (northern Thai, a specific name in the Chiengmai area) ; *Klue tuan* (far southern Thailand, fide Kerr ; name also applied to the subspecies *microcarpa*).

Remarks :—

This subspecies is, in general aspect, nearest to the subsp. *malaccensis*. It differs in that the plants are commonly (but not always) of shorter stature ; there is less black and brown smudging on the pseudostems ; the peduncle is often (but not always) glabrous ; the fruits are commonly smaller and, above all, the male buds are imbricate and have bracts paler, more purple in tone, often slightly yellow-streaked (at least in Malaya), and with pale yellowish tips. There is also a marked difference in distribution and ecology, *malaccensis* being the form of equatorial Malaya, *siamea* the form of the Monsoon lands of northern Malaya, Thailand and Indochina. Probably none of the characters given above would suffice to identify any particular plant with certainty ; even the very characteristic imbrication of the male bud is lost with age, and pigmentation and waxiness are somewhat dependent on nutrition, age, exposure and so forth. But when whole populations are considered, the differences are striking. Inclusion of Cheesman's Annam form in this subspecies is based on re-examination of I.C.T.A. Intro. 144 in the light of field work in Thailand and with the knowledge that one of my collections (B.E. 76) came from very near the borders of Indochina.

4. **Musa acuminata** *Colla* subsp. **microcarpa** (*Beccari*) *Simmonds*, stat. nov.

M. microcarpa Beccari, Nelle Foreste di Borneo, 623 (1902) ; Cheesman, Kew Bull. **1948,** 25.

M. truncata Ridley, J. Fed. Malay States Mus. **4,** 80 (1909) ; Cheesman, Kew Bull. **1948,** 26.

M. acuminata Colla, the Camerons form, of Simmonds, Malayan Nat. J. **10,** 3 (1955).

Banana Expedition Records :—

MALAYA : Ginting Sempak, Selangor, 2000 ft. (B.E. 57, 12.2.55, MP) ; Brinchang District, Cameron Highlands, Perak-Pahang, up to 5500 ft. (B.E. 58, 16.2.55, MPS ; B.E. 59, 16.2.55, S) ; near Ringlet, Cameron Highlands, Perak, 3700 ft. (B.E. 60, 17.2. 55, PS) ; Kenayat area, 10 mi. south of Grik, Perak (B.E. 61, 23.2.55, PS) ; Pelang, 10 mi. north of Grik, Perak (B.E. 62–4, 24.2.55, PS).

Other Records :—

MALAYA :—Telom, Pahang (*Ridley* 13694, in Herb. Singapore, the TYPE of *M. truncata* Ridl.) ; Ulu Ayam, Kemaman, southern Trengganu, 500 ft. (in Herb. Singapore) ; Gunong Lang, southern Kedah (*Corner*, Singapore Field No. 3500 = I.C.T.A. Introduction 180).

BORNEO :—Mentendok R., Kinabalu, Br. N. Borneo, 2900 ft. alt. (*Carr*, Singapore Field No. 26737—" leaves plain green, sheaths more or less suffused dark purple ") ; near Tarat Agricultural Station, First Division, Sarawak (I.C.T.A. Introduction 303, maintained as Clone Sarawak B).

THAILAND :—Ban Pien, Songkla (*Kerr*, 14821, 27.3.1918 in Herb. Mus. Brit.—"trunk deep purple ") ; Betong, Patani (*Kerr* 7643, 24.8.1923 in Herb. Mus. Brit.).

Vernacular Names :—

MALAYA :—*Pisang utan* (" jungle banana ", Malay, a generic name).

BORNEO : *Pisang langgai* or *P. lentit* (I.C.T.A. Intro. 303).

THAILAND :—*Klue tuan* (far southern Thailand, fide Kerr, the name also applied to subsp. *siamea*).

Remarks :—

This subspecies is characterized by the yellowish tinge and virtual waxlessness of the foliage, by the intense chocolate brown pigmentation of sheaths and, often, midribs, by the fading purple flush on the peduncle and male rachis, by the plump non-imbricate male bud, by the bracts purple without and pale red within and but weakly rolled at the time of falling and by its essentially montane distribution.

The fruits are variable in size. Most commonly they are short and slender as in typical *M. microcarpa* and B.E. 58, for example ; sometimes however they attain 10—12 cm. in length as in B.E. 57 and B.E. 60–64. Variability in fruit size was matched by variability in ovule number, which ranged in three samples from 130 to 210 ovules per ovary. The bunches are usually horizontal, but sometimes oblique, and plants that combined large fruits with an oblique bunch habit were selected as of possible use in banana breeding. The montane distribution is inconstant, for the subspecies descends to low altitude in northern Perak and probably elsewhere in Malaya. Evidently there is some ecotypic differentiation within the subspecies in this regard for it is our experience at I.C.T.A. that the montane forms do not thrive at low altitude (Cheesman loc. cit. ; also, our Introduction 180 grows very poorly). In Borneo, *Carr* 26737 came from high altitude while our Introduction 303 grows satisfactorily in Trinidad : from this I infer that there is some altitudinal differentiation in the island similar to that which exists in Malaya. Comments on the occurrence of hybrids between this and the subspecies *malaccensis* are made below.

5. **Musa acuminata** *Colla* subsp. **burmannica** *Simmonds*, subsp. nov.

M. acuminata Colla, the Tavoy form, of Cheesman, Kew Bull. **1948,** 27 ; Dodds and Simmonds, Heredity **2,** 101–117 (1948) ; Simmonds, Journ. Genetics **51,** 458–69 (1953) and Evolution, **8,** 65–74 (1954) (cytogenetics).

M. acuminatae Colla subsp. *microcarpae* ob folia cera carentia ac alabastrum masculum saturate purpureum affinis, sed fructibus densius conglomeratis bracteis alabastri masculi imbricatis intus intense puniceis differt, praterea regionum diversarum incola.

Records :—

Burma :—locality unspecified (I.C.T.A. Introduction 124, clone Calcutta 4, Cheesman loc. cit.) ; Tavoy District, Tenasserim, Lower Burma (I.C.T.A. Introduction 187, clone Long Tavoy, Cheesman loc. cit., the TYPE of subsp. *burmannica*, specimens in Herb. Kew.) ; Tagwin Chaung, Myitkina District, Upper Burma (*Parkinson* 1758, 24.11.1928 in Herb. Kew.).

Thailand :—Kaw Tao (island off southwest Thailand, geographically southern Mergui archipelago) (*Kerr* 16017, ex E. E. Cheesman MSS, not seen by me ; the plant had a pendulous bunch and probably belongs to this subspecies).

Vernacular Names :—

Burma : *Taw-byaw* (Taw—" jungle " ; byaw—" happy " ; i.e. at home in the jungle ; Burmese, Cheesman loc. cit.) ; *Nga-souk* (Kachin, northern Burma, fide Parkinson 1758).

Remarks :—

This seems to be a good place to name this subspecies though I was unfortunately prevented by political conditions in Burma from studying it in the field. It is distinguished by its yellowish and waxless foliage, light brown markings on the pseudostem and by its compact pendulous bunch and strongly imbricate purple bracts. It has been shown to be highly differentiated genetically from the subsp. *malaccensis* (references above). It has been chosen for its vigour and pendulous bunch for use in banana breeding and attempts are being made to combine these characters with the long fruits of the subspecies *banksii*.

General Remarks on Musa acuminata

I have chosen subspecific rank for the various forms of *Musa acuminata* because :

1. They are distinct geographico-morphological units, a fact which has long been implied or assumed by banana botanists but which was hitherto unsupported by the necessary field work.

2. Cytogenetic experiment (e.g. Dodds and Simmonds, Heredity, **2,** 101–17 (1948) ; Simmonds, Journ. Genetics, **51,** 32–40 (1952) ; Journ. Genetics, **51,** 458–69 (1953) ; and unpublished) and observation in the field agree in showing that the several forms are interfertile, so that the whole assemblage must form a panmictic unit (so far as geography permits). The field evidence of hybridity was most striking in Malaya where populations of the subspp. *microcarpa* and *malaccensis* march together. Thus on the Cameron Highlands road from Tapah to Tanah Rata, *malaccensis* occurred from low altitudes up to 2,000 feet ; the higher altitudes from 1,500 to about 5,500 feet, were occupied solely by the subsp. *microcarpa* and there was an intermediate zone about 6 miles in depth (miles 16–22 of the road) in which both occurred ; in this zone a small minority of plants showed signs of hybridity, one for example having the plant colours and waxiness of subsp. *malaccensis* but the male bract colour and flowers of *microcarpa* and a bud of intermediate shape.

On another hill road, Ginting Sempak, both subspecies occurred together again, *malaccensis* ascending to the top at about 1,900 feet, *microcarpa* descending to 800 feet or thereabouts on the Selangor side ; all flowering plants examined were confidently assigned to one subspecies or the other but some non-flowering plants appeared to be of hybrid origin. Further north in Malaya, in the Sungei Perak valley between Kuala Kangsar and Grik, *microcarpa* descends to low altitudes and hybridizes extensively with *malaccensis* which is there at the northern limit of its known range ; signs of hybridity were common throughout the area and one exceptionally clear example of a hybrid swarm was seen at Kenayat, some 10 miles south of Grik. This stand, predominantly *microcarpa* in aspect and lacking " pure " *malaccensis*, had the appearance of *microcarpa* introgressed by *malaccensis* at least two generations previously.

These were the only boundaries common to two subspecies that I had the opportunity of examining in the field ; others must occur in north-eastern Malaya (*microcarpa–malaccensis–siamea*, a situation of potentially extreme complexity) and along the hills of the Thailand–Burma border (*siamea–burmannica*) ; also, *burmannica* and *microcarpa* may well meet somewhere in the Kra Isthmus–Mergui Archipelago region. In New Guinea, as was pointed out above, the occurrence of bottle-necked fruits and bright red bracts in populations predominantly *banksii* probably indicated introgression by a different subspecies native in the west of the island.

There follows a key to the known subspecies of *M. acuminata* ; I have not attempted to include the East African, south Indian, Indonesian and Philippine forms of the species all of which are poorly known—there may well be four or five other subspecies still awaiting definition.

1.	Sheaths waxless except in young suckers ...	2
	Sheaths waxy	3
2.	Pseudostems intensely brown-pigmented ; male bracts pale red within, not imbricate ...	subsp. *microcarpa*
	Pseudostems lightly pigmented ; male bracts crimson within, imbricate	subsp. *burmannica*
3.	Sheaths lightly waxy ; female flowers, at least the upper ones, male-fertile ; fruits subobtuse ; ovules more than 200 per ovary ; bracts yellow or dirty dull red	subsp. *banksii*
	Sheaths strongly waxy ; female flowers male–sterile ; fruits acuminate ; ovules fewer than 200 per ovary ; bracts bright red or purplish red	4
4.	Bracts bright red without, quickly deciduous, non-imbricate	subsp. *malaccensis*
	Bracts purplish red without, with yellowish tips, often slightly persistent, usually imbricate in the young bud	subsp. *siamea*

6. **Musa flaviflora** *Simmonds*, sp. nov.

M. acuminata Colla, the Mariani form of Cheesman, Kew Bull. **1948,** 28 (descr. & fig.) ; Simmonds, Journ. Genetics **51,** 32 (1952).

? *M. sapientum* subsp. *seminifera* form *thomsoni* King MSS ex Baker, Ann. Bot. **7,** 214 (1893) ; Cheesman, Kew Bull. **1948,** 327.

? *M. thomsoni* King MSS ex Cowan and Cowan, Trees of North Bengal, 135 (1929).

Sect. *Musae*, *M. acuminatae* Colla subsp. *siameae* similis sed bracteis alabastri masculi laete rubris, floribus masculis flavis, modo generandi differt ; Assamiae incola.

Banana Expedition Records :—

India : Mahadeo Village below Cherrapunjee, Assam, 3000 ft. (B.E. 85, 1.5.55, MPS) ; Barnihat District, northern Khasi hills, Assam (B.E. 88, 3.5.55, MPS) ; Nowgong to Golaghat, Assam, 4.5.55, locally abundant ; lower Manipur road above Dimapur, up to about 3000 ft., 6.5.55, locally abundant ; ca. 18 mi. northeast of Imphal, Manipur, 9.5.55—not flowering, determination uncertain ; Burma road, near the Burma border, ca. 60 mi. from Imphal, in sheltered gulleys at ca. 2000 ft., 10.5.55—not flowering, determination uncertain ; Haflong area, Assam, 2000 ft. (13.5.55, P).

Other Records :—

India :—Mariani hills, Assam (I.C.T.A. Introductions 209, 211 and 241, Cheesman loc. cit. ; specimens of I.R. 209 in Herb. Kew., the TYPE of *M. flaviflora*).

Vernacular Names :—

India :—*Kait dewrit* (*Kait*—" banana ", *dew*—" soil ", *rit*—" five " ; Khasi tongue at Cherrapunjee) ; also *Losoarung* (Loso—?, *arung*—" tree ", Mikir tongue at Barnihat) ; *Nachang* (Biete tongue at Haflong) ; *Inkena* (" smallest "—Naga tongue at Haflong, the name indicating the smallest of the local wild species) ; Baker, loc. cit., quotes King's MSS notes to the effect that *Kergel* is a specific name in Lepcha for *M. thomsoni*.

Remarks :—

This species resembles *Musa acuminata* and on purely morphological grounds would best be treated as the northernmost subspecies of it. It differs from all known forms of *acuminata* in bract colour, in the male flowers suffused with orange yellow, in the virtually complete methylation of the bract anthocyanins (Simmonds, *Ann. Bot. Lond.* **18,** 474, 1954) and, above all, in its breeding behaviour in which it shows itself to be more closely allied to some species of Rhodochlamys than to any other known Eumusa (Simmonds, *J. Genet.* **51,** 32 (1952) ; Shepherd, unpublished). Its known distribution is Assam south of the Brahmaputra but it may well occur in the foothills of the eastern Himalayas and in northern Burma. The occurrence of natural hybrids of it with *M. velutina* Wendl. & Drude is discussed below.

Musa thomsoni is a manuscript name of King taken up by Baker and by Cowan and Cowan loc. cit., but inadequately described. Baker states that the bracts have " vertical streaks of yellow and purplish brown " outside which does not agree with the bright red of *M. flaviflora*. His publication of the name, incidentally, by Arts, 42 and 43 of the code, is probably invalid. King's plant evidently came from low altitudes in what is now the Darjeeling District of India or Sikkim and his specimens (*King*, Sikkim, *ann.* 1875–6 in Herb. Calcutta and Herb. Kew) could well belong here ; however he apparently also determined *Hooker*, Sikkim 2,000 ft., in Herb. Calcutta, as the same species, a collection which I

believe to be more probably *Musa balbisiana* Colla. I did not find *M. flaviflora* at low altitudes in the Darjeeling District or Sikkim and I wonder whether King's " Sikkim " label may have been applied to plants from Assam. I conclude that *M. thomsoni* is so ill described and typified that it may well be rejected ; if it can ever be certainly identified then less confusion will result from the treatment adopted here than by taking up *thomsoni* for the Assam species if they are not in fact the same.

7. **Musa balbisiana** *Colla*

Cheesman, Kew Bull. **1948,** 11.

M. sapientum subsp. *seminifera* form *pruinosa* King MSS ex Baker, Ann. Bot. **7,** 214 (1893) ; Cheesman, Kew Bull. **1948,** 327.

M. sapientum var. *pruinosa* King MSS ex Cowan and Cowan, Trees of North Bengal, 135 (1929).

Banana Expedition Records :—

New Guinea :—frequent between Napapa and Keravat, Gazelle Peninsula, New Britain (23.11.54, P) ; Vunarima Mission near Keravat (30.11.54, P) ; Gaulim, Gazelle Peninsula, New Britain (B.E. 12, 1.12.54, M) ; Lae, New Guinea (B.E. 41, 24.12.54, M) ; Snake River valley between Lae and Bulolo, New Guinea, very abundant on gravelly alluvium, about 2000 ft. (B.E. 46, 28.12.54, MP).

Sikkim :—by the Tista River at Dikchu, 2000 ft. (B.E. 81, 24.4.55, MP).

India : Rangpo, by the river on the Kalimpong–Sikkim border*, about 1000 ft. (B.E. 83, 26.4.55, PS) ; abundant by the Coronation Bridge, Tista Gorge below Kalimpong (27.4.55, P) ; Mahadeo Village below Cherrapunjee, southern Khasi hills, Assam, 3000 ft. (B.E. 86, 1.5.55, PS) ; Barnihat area, northern Khasi hills, 3000 ft. (B.E. 87, 3.5.55, PS) ; Manipur road above Dimapur, up to about 3000 ft., locally very abundant (no collections) ; Lumding–Haflong area, eastern Khasi hills, Assam, locally abundant (no collections).

Other Records :—

New Guinea :—Garaina, Morobe District (N.G.F. 6968, March 1955).

India : Garo Hills, Assam (*Clarke,* 43070 A, 11.2.1886 in Herb. Kew.) ; Sitapahar Forest Reserve, Chittagong hills (*Heinig,* August 1903, in Herb. Calcutta) ; Mungpoo, Sikkim (*Ribu,* May 1903, in Herb. Calcutta—fragmentary but probably this species, especially as the locality is the same as my B.E. 83).

Burma :—Tagwin Chaung, Myitkina District (*Parkinson* 1760, in Herb. Kew.) ; Tagwin (*Kermode,* I.C.T.A. Intro. 186).

China :—Hong Kong (Herklots, Food and Flowers, **1,** 44 (fig.) (1948)).

Hawaii : Mapulehu valley, Molokai (I.C.T.A. Intro. 468, sent by A. J. Mangelsdorf, 1955 ; the plants have not flowered but the seeds and seedlings are unmistakably this species).

Occurrence in Cultivation :—

Australia :—Botanical Gardens, Brisbane, Queensland (grown at I.C.T.A. in 1947–8, as Intro. 266).

Malaya :—cultivated around Kuala Trengganu for the leaves which are used for wrapping, the young fruits which are pickled and the male buds which are eaten as a vegetable ; similarly cultivated in Malacca (Howes, *Kew Bull.* **1928,** 323) and probably elsewhere in the Federation.

Thailand : general, in cultivation for the same uses as in Malaya—collected at Nan (B.E. 78, 6.4.55, MP) ; " Evergreen forest in temple grove ", Bangkok (*Kerr,* 6743, 4.2. 1923, in Herb. Mus. Brit.).

India : common in Assam and Manipur.

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* So abundant and such a characteristic feature of this alluvium-filled bend of the river that the locality is called locally *Kera Bari,* the banana garden.

Vernacular Names :—

New Guinea :—*Kalapua* (near Keravat, New Britain, the name of a local cultigen which much resembles *M. balbisiana* because largely derived from it in origin) ; *Yuruska* (B.E. 12, Gaulim, New Britain, the name referring to " a shady place ").

Malaya : *Pisang batu* (" stone banana ", Malay, fide Howes, *Kew Bull.* **1928,** 323), but the name is sometimes also applied (e.g. at Ulu Langat) to cultigens of this affinity which are not normally at all seedy and are never fully so ; *Pisang gala* (Malay, at Kuala Trengganu) ; *Pisang bidji* (" seed banana ", Malay, ex Department of Agriculture records, referring to an unidentified cultivated seedy type that probably belongs here).

Thailand :—*Klue pa, Klue tani, Klue tani-pa* (Thai ; *Klue*—" banana ", *tani*—?, *pa*—" wild " ; the name *tani* is probably borrowed from a related cultigen and this, together with the lack of a specific vernacular in country (northern Thailand) where the other wild species all have specific names, is powerful evidence that it is indeed not native there).

China :—*Ye tsiu* (" Wild banana "—Cantonese at Hong Kong—Herklots loc. cit.).

Burma : *Nga-toe* (Kachin, fide *Parkinson* 1760) ; *Taw-nget-pyaw-gyi* (" Big jungle banana "—Burmese, I.C.T.A. Intro. 186).

Sikkim :—*Ralim, Kargok* (Lepcha, generic names for wild bananas, to be contrasted with *Kardung*, bananas in general. I noted the name *Ralim* at Dikchu and assume that it is the same as *Reling* of King's MSS notes and labels ; but, curiously, it was not known in these or any other forms to Mr. McDonald of Kalimpong, despite his extensive knowledge of the languages of that part of the Himalayas ; it may be that I misunderstood my informant and that *Ralim* is a little-known specific name for this species, as implied by King and Baker, loc. cit.).

India : *Bon kera* (" wild banana ", Nepali, a generic name) ; *Kait dewsan* (*Kait*—" banana ", *dew*—"soil ", *san*—"five ", Khasi tongue near Cherrapunjee) ; *Luchinarung* (*Luchin*—?, *arung*—" tree ", Mikir tongue at Barnihat) ; *Chungbi anguoba* (*Chungbi*—?, *angouba*—" white ", Manipuri near Imphal, to be contrasted with *Ch. amuba* (" black") for *M. itinerans* in the same area) ; *Narop* (Biete tongue) and *Hanak* (Naga tongue) (both meaning " hard " in reference to the toughness of the leaves for wrapping) at Haflong.

Remarks :—

The discovery that *M. balbisiana* is not native in Malaya and Thailand is of considerable interest ; I know of no certain evidence that it is native in Indonesia either, though surely widely cultivated there. Thus the species is recorded in Herbarium Amboinense under the heading *Musa sativa seu domestica* as *Pissang batu seu Pissang bidji*. In Java (as *M. brachycarpa* Backer) it is " found wild on cliffs and in ravines in the district of Djember " (Backer, Fl. v. Java, **3,** 135 (1924)) although also " not infrequently grown for its leaves " under various vernacular names of which *Pisang batoe* is one ; this vernacular name, the same as one used in Malaya, and the limited distribution of the " wild " plant suggest to me that the species was introduced to Java and became locally naturalized there. There is no evidence at all of its occurrence in Borneo but it seems to be truly native—certainly it is widespread and locally abundant in " natural " habitats—in the Philippines and New Guinea. A revised statement of its distribution is, therefore : India from Ceylon to Assam, Sikkim, northern Burma, southern China, Philippines, Hawaii (? native or naturalized), eastern New Guinea and New Britain ; cultivated and perhaps locally naturalized in Thailand, Malaya and Indonesia and widely grown in tropical botanic gardens.

Musa sapientum var. *pruinosa* refers primarily to *Musa balbisiana* but is somewhat confused for, of specimens so named by King in Herb. Kew, one is *M. sikkimensis* Kurz which is doubtless responsible for King's manuscript note (reproduced by Baker, loc. cit.) that the seeds are " largeish $\frac{1}{4}$ in.". Baker's use of the name is almost certainly invalid by Articles 42 and 43 of the Code.

8. **Musa itinerans** *Cheesman*

Cheesman, Kew Bull. **1949,** 23.

Banana Expedition Records :—

Thailand :—in sheltered gulleys on Doi Chiengdao near Chiengmai, alt. 2000 ft. (B.E. 73, 1.4.55, MP) ; Doi Sutep near Chiengmai, alt. 4000 ft. (B.E. 75, 2.4.55, MPS) ; Banphasing, ca. 8 mi. north of Nan on the way to Pua (B.E. 77, 5.4.55, MP) ; Pangtonpheung, near Uttaradit (7.4.55, P).

India :—Sapermeina, some 20 mi. north-east of Imphal, Manipur, 3000 ft. (B.E. 91, 9.5.55, MPS).

Other Records :—

Thailand : Doi Sutep, 1550 m. (*Kerr* 3506, 2.1.1915, in Herb. Mus. Brit.).

Burma :—Tagwin Chaung, Myitkina District, 400 ft. (*Parkinson* 1761, in Herb. Kew.).

Vernacular Names :—

Thailand :—*Klue daeng* (" red banana ", Chiengmai area) ; *Klue hok* (" running banana ", northern Thai in the Nan area, a reference to the rhizome habit of the plant and a pleasing parallel to Cheesman's Latin name).

Burma : *Nga-gup* (Kachin, fide *Parkinson*, 1761) ; *Hpu-gyaing-nget-pyaw* (" Banana with sweet-smelling male bud "—Burmese, fide Kermode on I.C.T.A. Intro. 185, TYPE of *M. itinerans*).

Remarks :—

Seed size was less in my Indian collection (B.E. 91, 4–5 × 2–3 mm.) than in the Thai plants and in the I.C.T.A. plants from Burma described by Cheesman (5–7 × 3 mm.) ; there was also some variability in colour, B.E. 77 having faint touches of pink on the fruits (hence one Thai vernacular) and on the compound tepals of the male flowers, and B.E. 91 having a faint transient purple flush on the young laminas.

This may be a good place to draw attention to the fact that genetic research has shown that *M. itinerans* Cheesm. is closely allied to *M. basjoo* Sieb. from the Liukiu archipelago (Simmonds, Evolution, **8,** 65 (1954)). Study of the geographically intermediate forms—if any—in Indochina and southern China would be extremely interesting. I have seen a number of herbarium specimens of wild bananas from Yunnan but have unfortunately been unable to identify any of them with confidence.

9. **Musa schizocarpa** *Simmonds*, sp. nov.

Sectionis *Musae* ; plantae magnae vix cereae vel coloratae ; flores basales hermaphroditi ; ovula biseriata ; fructus maturi virides, cute longitudinaliter dehiscente ; bractearum cicatrices prominentes ; alabastrum masculum turbinatum, haud imbricatum, bracteis deciduis obtusis laevibus coriaceis viridi-flavis ; in regione Novae Guineae orientalis necnon Papuae vulgatissima.

Section *Musa* ; *chromosome number* 2n = 2x = 22 ; *plant* tall (up to 6 m.), stooling ; *pseudostems* robust, bright green and little waxy above, not or but slightly marked with brown, variably rusty-brown at the base, the undersheaths yellow or pale pink, juice watery throughout ; *petioles* deeply channeled, tightly clasping at the base, smooth or slightly wrinkled, the margins erect or somewhat inclosed ; *laminas* large, up to 250 × 65 cm., rounded, often unequal at the base ; *inflorescence* at emergence long-cylindrical, ca. 40 × 10 cm., the bracts deciduous, slightly imbricate

at the obtuse tips, pale green and finely ribbed outside, yellow inside ; *flowers* in basal hands of inflorescence hermaphrodite, 20–30 per hand, biseriate, each with an ovary 6 cm. long, pale yellow turning green, tapered to the base ; *compound tepal* 4 cm. long, creamy in colour tipped with yellow and rather deeply (8 mm.) toothed ; *free tepal* translucent, boat-shaped, slightly corrugated, irregularly dentate, 2 cm. long ; *anthers* (2–) 5, pale brownish in colour ; *stigma* robust, yellow, slightly shorter than the perianth ; *ovules* biseriate in each loculus ca. 270 per ovary ; mature *fruit bunch* large, oblique or pendulous, borne on a massive glabrous peduncle 5–6 cm. thick and bearing up to 15 hands of biseriate, densely packed fruits, 20–30 per hand ; *fruit* straight, plump-angular, up to 10 × 3·5 cm., sharply narrowed into the pedicel (2–3 cm. long) below and sharply bottlenecked at the tip, faintly deciduous-waxy and dark green in colour with a thick skin splitting and peeling back from the tip at maturity, without change of colour, to expose a dead-white lining and a mass of seeds embedded in white sweet-acid-gelatinous pulp ; *seeds* rounded-angular, smooth, light to dark greyish-brown, with a faint umbo opposite the hilum, 5–8 mm. broad × 3–4 mm. deep but occasionally smaller (e.g. B.E. 49— 4–6 × 2–3 mm.) ; *male axis* up to 120 cm. long, 3 cm. thick at the base narrowing to 1·5 cm. at length, the bract insertions prominent, up to 5 cm. long, the male bud dying off at about the time of maturity of the fruit ; *male bud* in advanced blooming turbinate, high shouldered, somewhat rounded at the tip, about twice as long as broad (less in old age) non-imbricate, the bracts rolled back at lifting, rapidly and completely deciduous with the flowers they subtend ; *bracts* ovate, obtuse, pale green, commonly tinged with faint greyish-purple, smoothly-dull and faintly ribbed without, yellow faintly veined with green and shiny within, general texture smooth-leathery ; *male flowers* 15–25 per bract, biseriate, the ovary white, 12–15 mm. long, the compound tepal 3–4 cm. long, creamy yellow with yellow tip, the free tepal translucent, 15–18 mm. long, not or slightly corrugated, obtuse, usually with a small triangular point, anthers five, creamy, borne on white filaments, nectar abundant ; *freakish flowers* common (e.g. B.E. 47).

Banana Expedition Records :—

New Guinea :—near Dagua, Sepik District (B.E. 13, 7.12.54, MPS, TYPE in Herb. Kew.) ; Bainyik, Sepik District (B.E. 17 and 20, 8.12.54, M ; B.E. 18, 8.12.54, S) ; Kunjingini, Sepik plains (B.E. 19, 9.12.54, MPS) ; Saidor, Madang District (B.E. 26 and 27, 14.12.54, M) ; Baiyer River valley, Western Highlands, 4000 ft. (B.E. 37, 19.12.54, MP ; B.E. 28, 19.12.54, S) ; middle Markham Valley below the Chasan Gap, Morobe District, 2000 ft. (22.12.54, no collections) ; Yalu River near Lae, Morobe District (B.E. 42, 24.12.54, MS) ; Kaindi, above Wau, Morobe District, abundant 3800–4200 ft. (B.E. 47, 29.12.54, MS) ; Wau to Bulolo and the Wompit River valley down to the Markham, locally abundant (30.12.54, no collections).

Papua : Omati, Gulf Division (B.E. 49, 14.1.55, MPS) ; Jesubaibua, Mekeo District, Central Division (B.E. 52, 20.1.55, MPS) ; near Eilogo, Sogeri Plateau above Port Moresby, Central Division, 2000 ft. (B.E. 54, 23.1.55, M).

Other Records :—

New Guinea : near Lae (I.C.T.A. Intro. 397, coll. J. S. Womersley, Oct. 1952) ; Garaina, Morobe District (N.G.F. 6959, January 1955, I.C.T.A. Intro. 463).

Vernacular Names :—

New Guinea : *Waniga* (Dagua, Sepik District) and *Sabulong* (Saidor, Madang District), both local generic names for wild bananas.

Papua : *Emoa* (Mekeo, Central Division).

Remarks :—

This very handsome species is distinguished from all other Eumusas by its peeling fruits, a character which was previously known in the sections Rhodochlamys (*M. velutina* Wendl. and Drude, Cheesman, Kew Bull. **1949,** 135, pl. 2) and Australimusa (*M. lolodensis* Cheesman, Kew Bull. 1950, 28, pl. 1). Indeed I first took it to be an Australimusa because of this character, its geographical origin, the somewhat polished sheaths and the large seeds reminiscent of those of *Musa maclayi*. However it lacks the polished imbricate bracts of that section and its chromosome number (Shepherd) is 2n = 22. I thought on first acquaintance that two species (or perhaps, varieties) were concerned in the collections here treated as one species ; one entity seemed, in comparison with the other, to be more slender and more waxy and to have smaller and more open bunches of fruit of lighter green colour. The fruits of this entity, however, we never found in the ripe condition and it gradually became clear that it was merely an immature state of the plant growing in poorer sites, the wax being eroded and the fruits filling and darkening with age.

A note on **Musa fitzalani** *F. Muell.*
(Mueller, Fragm. Phyt. Austr. **9,** 188 (1875))

Consideration of this species may well be interpolated here for it is apparently allied to *M. schizocarpa*. It was described from the Daintree River in Queensland but has not been found there or elsewhere in the State on recent search ; it is now certainly rare and may well be extinct. The TYPE (*Fitzalan*, " Musa no. 3 ", Daintree River, in Herb. Melbourne) bears the following note :

> Grows up the left hand branch of the Daintree—stems about 20 feet high, robust and very green, leaves about 12 feet long standing at nearly right angles to stem, bunch of fruit drooping —fruit triangular, yellow when ripe and full of seed—flower french white with purplish tips. Specimens sent of fruit, flower and section of leaf.

The " flower " here is evidently the male bud and the notes agree passably well with the pale greenish bracts sometimes flushed with pale greyish purple of *Musa schizocarpa* ; the " very green " (presumably non-waxy) stems, the drooping bunch, the fruits (though small—ca. 5 × 2 cm. plus pedicel 2 cm.) and the seeds also agree. The fruit " yellow when ripe " however certainly does not agree and in this connexion it is of interest that Mr. J. S. Womersley believes that there is, in the Garaina area of New Guinea, a species allied to *M. schizocarpa* which differs from it in just this character.

A note on **Musa charlioi** *W. Hill, nomen dubium et nudum*

I am indebted to Mr. S. T. Blake of the Brisbane Herbarium for the following transcript of Hill's description (Rep. Brisbane Bot. Gdn. **1874,** 7) :—

> *Musa charlioi* W. H.—Herbaceous, stem dingy green, simple, thirty to forty feet long, thickly clothed with sheathing petioles of the leaves ; leaves oblong five to six feet long, forming a tuft

on the apex of the stem, spadix nodding, fruit obliquely elliptical, oblong, three to four inches long, fleshy, with numerous small hard dry seeds.

Hab.—In rich alluvial soil on the banks of the Johnstone River.

A new variety of what is popularly termed wild banana, called after one of the troopers of the Native Police who was found very useful upon the expedition.

There are obvious inaccuracies in this description (a stem thirty or forty feet tall that bore leaves five to six feet long would be an extraordinary banana indeed) and not one useful diagnostic character is given ; there are no collections in Herb. Brisbane and it is virtually certain that none exists. The name may well be rejected ; the plant was presumably either *Musa acuminata* subsp. *banksii* or *Musa fitzalani*.

10. **Musa nagensium** *Prain*

Cheesman, Kew Bull. **1948,** 325.

Banana Expedition Record :—

Thailand : one non-flowering plant in a valley above Djoo Galaho village near Chiengdao, north of Chiengmai, 2000 ft. (1.4.55, P).

Other Records :—

India : specimens cultivated at the Calcutta botanical gardens from plants from the " Naga Hills " and from Tingali Bum (TYPES in Herb. Calcutta, some duplicates in Herb. Kew.).

Burma : Indawgyi Reserve, Myitkina District, 2500 ft., common from 600–3300 ft. (*C. Gilbert Rogers* 843, 11.5.1919 in Herb. Calcutta) ; Tagwin Chaung, Myitkina District, in forest, 400 ft. (*Parkinson* 1759, 24.11.1928 in Herb. Kew.).

Vernacular Names :—

Thailand :—*Klue kem* (northern Thai at Chiengdao).

Burma : *Lek-chep* (Kachin, fide *Parkinson* 1759) ; *Ngapyaw-nwe* (*Ngapyaw* = *nget-pyaw*, " banana " ; *nwe*—" climbing " (or perhaps from *ngwe*—" small ") Burmese, fide Kermode on I.C.T.A. Intro. 188).

Remarks :—

It is unfortunate that I could find no flowers of this interesting species but am reasonably confident nevertheless of the identification of the Thai plant ; the slender and slightly-suckering plant, the widely spaced leaves, the intense waxiness, the partly closed petiole, the dull crimson flush on petiole edges and midrib and the strongly auriculate lamina base were all very reminiscent of the I.C.T.A. plant from Burma (Intro. 188, Cheesman, loc. cit.).

It is worth drawing attention to one interesting fact about *M. nagensium* namely that its seeds (I.C.T.A. Intro. 188) are obscurely warty, subglobose but somewhat tapered towards the hilum and they have a distinct and relatively large hilum cavity. In these characters, except for wartiness, they resemble *Ensete* and, laid alongside seeds of *Ensete gillettii* (de Wild.) Cheesm., for example, are remarkably like them.

I know of no evidence to identify exactly the type locality in the " Naga Hills " ; Tingali Bum is presumably in the Singpho country of

far northeastern Assam near the borders of Burma and China. I found no evidence of the species in the Khasi hills-Central Assam-Manipur region so its distribution appears to be distinctly more eastern than that of its relatives which are treated next.

11. **Musa sikkimensis** *Kurz*

Kurz, J. Agric. Hort. Soc. India **5,** 164 (1878) ; Baker, Ann. Bot. **7,** 214 (1893) ; Cheesman, Kew Bull. **1948,** 326.

M. sapientum subsp. *seminifera* form *hookeri* King MSS ex Baker, Ann. Bot. **7,** 214 (1893) ; Cheesman, Kew Bull. **1948,** 326.

M. hookeri King MSS ex Cowan and Cowan, Trees of North Bengal, 135 (1929).

Plant robust, about 4 m. tall, foliage yellowish-green in colour ; *sheaths* smudged with blackish brown, devoid of wax except on young suckers and then faint ; *petioles* open with narrowly reflexed scarious wings ; *laminas*, the bases rounded or even slightly auriculate, flushed pale purple underneath at emergence, the colour later fading, longest persistent on the midrib ; *juice* watery ; *inflorescence* far outshot from the pseudostem, borne on a robust (4–5 cm.) pubescent peduncle ; *fruit bunch* oblique, rather lax, about 4 hands each of 7–9 biseriate fruits ; *fruits* splayed, massive, angular, 11 × 4 cm., bluntly rounded apiculate at the apex, abruptly tapered into the massive pedicel (2 × 1–2 cm.) at maturity green turning brown and drying off from the tip proximally, skin thick (5 mm.) and brittle rather than fibrous, enclosing a mass of large seeds embedded in a scanty dirty white or pale brownish-pink pulp ; *seeds* sharply angular, smooth, 6–10 mm. wide × 5–6 mm. deep with a saucer shaped hilum depression 2 × 1 mm. ; *male rachis* pendent, tapered rather markedly from base to apex, bract insertions not prominent, but long (far exceeding the flower scars) and curved, distant from each other at the base, much closer together at the distal end of the rhachis ; *male bud* in advanced blooming large, turbinate about 12 × 8 cm., very slightly imbricate at the tip, probably (judging by the male rachis) very large and more strongly imbricate when young ; *bracts*, 1–2 raised at a time, deciduous, not or but slightly rolled back before falling, broadly ovate, obtuse, slightly ribbed and waxy, dull (purple-) crimson and somewhat dull yellow-variegated at the basal margins without, dull (not shiny) and crimson to the base within, outer tips yellowish ; *male flowers* about 14 per bract, biseriate ; *compound tepal* pale creamy orange, paling towards the base, 35 mm. long ; *free tepal* translucent, colourless, non-corrugated, minutely denticulate at the tip, 16 mm. long ; *style* white below, creamy above, tapered into the narrow-elongate creamy stigma ; *stamens* five, equal to the compound tepal, the anthers white (pink in B.E. 92).

Banana Expedition Records :—

India : by the waterfall below Darjeeling, alt. 6000 ft. (B.E. 79, 21.4.55, MPS, NEOTYPE) ; non-flowering plants not uncommon in the Darjeeling-Peshok road area at altitudes of 5-6000 ft. ; Cherrapunjee, southern Khasi Hills, Assam, non-flowering plants ; Laimaton, 36 mi. south of Imphal, Manipur, on the Burma road, alt. 4000 ft. (B.E. 92, 10.5.55, MP ; B.E. 93, 94, 95, 10.5.55, S).

Sikkim : Gangtok, non-flowering, about 5500 ft. alt.

Other Record :—

India : Munipur (*Watt*, 5053, 7.1.1882 in Herb. Calcutta).

Vernacular Names :—

India and Sikkim : *Tiang moo foo goon, Chang moo foo kong* etc. (Lepcha, fide King MSS and Baker, loc. cit., a specific name in Sikkim) ; *Bon kera* (" wild banana ", Nepali at Darjeeling, a generic name) ; *Kardung* (" wild banana ", Lepcha at Gangtok, a generic name) ; *Layai* (*La*—" medium ", *yai*—" leaf ", Manipuri, a specific name for this species as distinct from *M. itinerans* and *M. balbisiana*, q.v.).

Remarks :—

Kurz, as pointed out by Cheesman, never described *M. sikkimensis* and no collections of his exist in Herb. Calcutta which might be ascribed to this species. I have therefore taken the course of describing the Darjeeling plant from which my B.E. 79 came and proposing that specimen as a neotype. It is true that one or several of the Hooker, Thomson and King specimens in Herb. Kew. and Herb. Calcutta might have been made the basis of the species but the confusion of specimens, labels, drawings and notes (published or otherwise) is such that there would have been a serious risk of including discordant elements. Confusion notwithstanding however, King's *Musa hookeri* is clearly this species, as Baker (loc. cit.) noted.

The Manipur plant represented by B.E. 92 differed from the Darjeeling plant in several respects and further study in that area and in the geographically intermediate Khasi Hills may show that it is at least varietally distinct. It differs in being less pigmented and more waxy, in the lightly wrinkled and erect rather than narrowly reflexed petiole wings, in the slightly more prominent bract scars and more strongly curled bracts, and in the shorter and thicker fruits (10 × 5 cm.) with thicker skins (5–10 mm.). Female flowers (which I could not find at that season in the Himalayan plants) were male-sterile and had irregularly 4-seriate ovules, about 300 per ovary.

At Haflong we heard of a hill banana that, from description might well be this species though the seeds were said to be somewhat smaller than those of B.E. 93 ; it was called *Changpui* (Biete tongue) or *Gumshang* (Naga), both names referring to its alleged large size. If it is indeed this species and if I am correct in the identification of the non-flowering plants at Cherrapunjee, then *M. sikkimensis* ranges widely over the higher ground between Thibet and Burma.

12. **Musa cheesmani** *Simmonds*, sp. nov.

Sect. *Musae* ; ob semina magna *M. sikkimensem* atque *M. nagensium* revocans sed ab ambabus seminibus aspere verrucosis distinguntur, praeterea ab illa colore vaginarum costarumque brunneo rubro petiolis clausis fructibus pallide viridibus graciliter pedicellatis ovulis biseriatis bracteis alabastri masculi imbricatis haud crispatis, ab hac planta minus cerea fructibus sursum flexis alabastro masculo latiore differt ; Assamiae incola.

Plant large and robust, densely stooling ; *pseudostem* somewhat swollen at the base, up to 6 m. tall, intensely brownish-red pigmented, with green or red undersheaths, slightly waxy towards the top, most conspicuously so in young suckers ; *petiole*, the margins narrowly scarious, inclosed and

tightly clasping the pseudostem ; *lamina* hardly waxy though greyish in tone, rounded at the base, midribs purple-brown ; *juice* watery-milky ; *inflorescence* oblique or pendulous, far outshot on a rather slender glabrous peduncle 4 cm. thick ; *female flowers* about 12 per bract, the ovary pale green, 6 cm. × 4–8 mm. wide, ovules biseriate and about 160 per ovary, compound tepal creamy shading to pale yellow at the tip, 4 cm. long, free tepal 2 cm. long, slightly corrugated, truncate-acuminate at the tip, stigma bright orange, style white, staminodes 5, white, very short ; *fruit bunch* very lax, up to 10 hands of fruit ; *fruits* biseriate in the centre of most hands (uniseriate in small bunches), curved-spreading and angular, tapering to the long (4 cm.) pedicel, acuminate at the apex, ca. 10 × 4 cm., pale whitish-green in colour but not waxy except on the pedicel and there only faintly so ; *seeds* flattened-subglobose, 8–10 × 5–7 mm. deep, intensely rough-warty ; *male rachis* pendulous, about 120 cm. long at fruit maturity, flushed purple just above the bud, the bract scars not prominent and rather widely spaced ; *male bud* turbinate, high-shouldered imbricate at the tip, about 2·5 times as long as broad ; *bracts* raised 1–2 at a time, deciduous, not rolled, ovate, obtuse at the apex, dull purple and finely ribbed, the tips yellowish-green without, deep crimson to the base within ; *male flowers* about 20 per bract, biseriate, the compound tepal 35 mm. long, pale creamy yellow with yellow tips, free tepal translucent, non-corrugated, truncate and minutely acuminate at the tip, 14 mm. long, anthers yellow, stigma orange.

Banana Expedition Records :—

India : on steep stony slopes by the Manipur road, 26 miles above Dimapur, Assam, 2500–3500 ft. (B.E. 90, 7.5.55, MP, TYPE of *Musa cheesmani*) ; the same, 32 miles above Dimapur (B.E. 96, 11.5.55, S) ; the same (B.E. 97, 11.5.55, M).

Vernacular Names :—

India :—*Kol* (Assami) *Kabu* (Naga) (both generic names noted at the type locality).

Remarks :—

This handsome species is very abundant on the lower stretches of the Manipur road and it is curious that it has not previously been recognised as distinct. It differs, however, in several important respects from its two large-seeded congeners and its seeds are, so far as is known, unique in the genus. Indeed I have seen nothing like them in any herbarium collection I have studied. They are strangely reminiscent of *Musa balbisiana* in being subglobose and rough-warty but more than twice as large in linear dimensions.

This species is named in honour of E. E. Cheesman, long Professor of Botany at the Imperial College of Tropical Agriculture and founder of modern banana botany.

13. **Musa** *sp. indet.*

Banana Expedition Record :—

Sikkim : near Dikchu, 3000 ft. alt. (B.E. 80, 24.4.55, MP).

Remarks :—

This curious plant resembled *M. sikkimensis* in its vegetative parts but was perhaps somewhat waxier and it had more blackish pigment on the

sheaths ; it bore an oblique bunch of 10 densely packed hands each of 15–17 fingers biseriately arranged ; the bunch was about two months old and the ovaries were swollen and upturned though none bore developing seed ; the ovules were quadriseriate in the loculus and numbered about 320 per ovary ; the male axis declined markedly in thickness towards the apex and the male bud had died off ; the bract scars were more prominent than those of *M. sikkimensis*.

It is tempting to look to the fourth and last of King's Sikkim bananas as a possible identity for this plant. *Musa sapientum* subsp. *seminifera* form *dubia* King ex Baker, Ann. Bot. **7,** 214 (1893) (*Musa sapientum* var. *dubia* King ex Cowan and Cowan, Trees of North Bengal, 135 (1929)) is exceptionally poorly described but what there is agrees with B.E. 80. One of King's specimens (*King*, Sikkim, 3500 ft., 5.10.75, in Herb. Calcutta) could well be the Dikchu plant for it has about the right size and number of fruits per hand and it apparently also has the tapering male rachis and early-dying male bud. In comparison with *M. sikkimensis* it appears to have smaller fruits (8 × 3 cm. ca.), shorter pedicels (1–2 cm.) and smaller and finely warty seeds (6–8 × 3–4 mm.) King gives the vernacular name *Ruxom* (*Luxon* or *Luxom*) which was unknown, except as a Lepcha surname to the several people in Sikkim of whom I made enquiry.

Whether or not my plant is King's *dubia*, there is one possibility which should be mentioned, namely that it is a hybrid between the two local species which it somewhat resembles—*M. sikkimensis* in vegetative characters and *M. balbisiana* in general aspect of the bunch ; the Dikchu plant bore no seed but the degree of swelling and negatively geotropic flexure of the pedicels suggest that some early growth had occurred ; this in turn suggests that pollination had occurred but that seed development had failed. Further, the Dikchu plant came from an intermediate altitude, as King's *dubia* also did and the seeds of the latter are intermediate in size and roughness between *M. sikkimensis* and *M. balbisiana*. In support of this possibility, there is the fact that another large-seeded Eumusa, *M. nagensium*, is known to yield vigorous natural hybrids with *M. balbisiana* (Cheesman, Kew Bull. 1948, 327).

B. **Musa** section **Rhodochlamys** *Baker* (including hybrids with species of sect. **Musa**).

14. **Musa** *sp. indet.*

Plant small with the scattered non-clumped habit of *Musa laterita* Cheesm. ; *pseudostems* ca. 2 m. tall ; *leaves* lightly waxy, tapered into the open petioles with spreading wings ; *inflorescence* erect at first, borne on a slender hairy peduncle ; *basal* 1–6 *hands* female, each with 12–14 biseriate and densely packed flowers enveloped in deciduous non-imbricate bracts ; *female flowers*, the ovaries bright green, 3 cm. long, with 120 biseriate ovules, markedly bottle-necked at the tips even at this early age, the compound tepal 25–30 mm. long, pale yellow, brighter at the tip with wavy-subauriculate basal margins, free tepal 12 mm. long, deeply boat-shaped, the tip acuminate and denticulate, staminodes about 1 cm. long ; *fruit* unknown (not set, though fertilizations had evidently occurred), probably small, densely packed and strongly bottlenecked at

the tip ; *neuter flowers*, about 4 hands, abortive, each ca. 1 cm. long ; *later hands* male, each bearing 4–6 flowers deciduous with the bracts, 1–2 seriate ; *male bud* long lived and large relative to the bunch, about 11 × 3–4 cm., erect at first but soon declining, more or less pendulous in age, the bracts deciduous, lightly curled, bright purplish-red, and lightly waxy without, crimson paler at the base within, strongly imbricate at the yellow-green subobtuse tips ; *male flowers*, the ovaries pale green, 6 mm. long, perianth and stigma orange-yellow, the compound tepal brighter at the tip, 37 mm. long, free tepal 1 cm. long, anthers pink, pollen sparse.

Banana Expedition Record :—

THAILAND :—in a steep valley some 8 mi. south of Chiengdao where the road to Chiengmai crosses the southern spur of Doi Chiengdao, 1500 ft. alt. (B.E. 74, 1.4.55, MP).

Remarks :—

In the area in which this collection came from (and elsewhere in northern Thailand) I heard of a plant locally called *Klue plidaeng* (" the red-flowered banana ") which resembled my plant in general habit but which was much smaller and had permanently erect inflorescences ; it was said to die down in the dry hot season and therefore to be unprocurable or at least very scarce at that time of year (April) ; doubtless it is a Rhodochlamys, the same as represented by *Kerr* 4561 (Wang Chao, Raheng, 12.11.1920) and *Kerr* 6143 (Me Klaung, Kampeng Pet, 16.6. 1922) both in Herb. Mus. Brit. and both probably *Musa rubra* Wall. ex Kurz (Cheesman, Kew Bull. **1949,** 266). I suspect that my plant is a natural hybrid between this species and a Eumusa, almost certainly *Musa acuminata* subsp. *siamea*. In favour of this interpretation are the following facts :—1. The joint presence of both putative parents in the area (*siamea* was growing a few yards away from B.E. 74 and the Rhodochlamys was reported locally on advice that proved sound in all other particulars that could be checked—the country folk of northern Thailand are excellent botanists) ; 2. the plant size and dry season persistence intermediate between those of the putative parents ; 3. the erect habit of the female part of the bunch, combined with the large numbers of biseriate female flowers ; the failure of seed set even though ovule and ovary swelling showed that fertilization had occurred and the sparseness of the pollen (but bad seed set might have been a result of the dry season, and pollen abundance is not easy to estimate in unaccustomed material) ; 4. the large, pendulous and long-lived male bud quite unlike that of any known Rhodochlamys but very reminiscent of *Musa acuminata* subsp. *siamea* in its size, shape, imbrication, greenish bract tips and colour, though not in the few flowers per bract.

Re-examination of the I.C.T.A. collection of interspecific hybrids confirms this conclusion. Hybrids of *Musa laterita* Cheesm. (from southern Burma, certainly closely allied to *M. rubra* Wall. ex Kurz, Cheesman loc. cit.) with *Musa acuminata* subsp. *burmannica* and subsp. *malaccensis* are both very similar to the Thai plant and they differ from it and from each other in characters which may be attributed to the *acuminata* parent ; the Thai plant is roughly intermediate in character between the experimental hybrids just as the subsp. *siamea* is roughly intermediate between *bur-*

mannica and *malaccensis*. Colour photographs of all these materials are deposited at Kew and we plan an experimental approach to the question by raising hybrids of *M. acuminata* subsp. *siamea* with various Rhodochlamyds.

15. **Musa flaviflora** *Simmonds* × **M. velutina** *Wendl. & Drude*

Banana Expedition Record :—

India : Methomi tea estate, Panbari Reserve, 35 mi. west of Golaghat, Assam (B.E. 89, 5.5.55, MP) ; along the railway line between Dimapur and Lumding (12.5.55, no collections).

Other Record :—

India : Sadiya, Lakhimpur, Assam (*Burkill*, 32645, 23.8.1909 in Herb. Calcutta—plants 12–15 feet high overall, midribs purplish below, flowers orange, fruits bronzed not hairy, inflorescence " very slightly nodding ").

Remarks :—

The banana population from which B.E. 89 was drawn occupied a small area (100 × 100 m. or thereabouts) of high second growth of which the underbush had been cut through in 1951. The area was bounded by high bush, a road and by tea fields ; of the banana area itself, about two-thirds contained what was apparently pure *M. flaviflora* and the remaining one-third was occupied by the hybrid population described here. We cut the first 25 inflorescences that we could find and scored each for 8 characters on a scale of 1 (*M. velutina*) to 3 (*M. flaviflora*), thus :— height to bunch (less than 4 ft.—1, 4–8 ft.—2, more than 8 ft.—3); midrib colour (red—1, pink—2, green—3) ; peduncle (hairy—1, slightly hairy—2, glabrous—3) ; bract base (red to the base—1, intermediate—2, yellow band at base—3) ; ratio of lengths of free to compound tepals (1·0 or nearly so—1, 0·5–1·0—2, less than 0·5—3) ; bunch angle (erect—1, oblique—2, horizontal—3).

The results were :—

Total score	**8**	9	10	11	12–14	15	**16**	17	18	19–21	22	23	**24**
Number	**1**	0	2	1	0	3	**3**	1	2	0	1	4	**7**
Identity	" velutina "					hybrid					" flaviflora "		

The distribution is distinctly trimodal, suggesting the presence of two parents and an F_1 ; this was probably not so, however, for three out of the four " velutinas " were markedly more robust than the species ever is on I.C.T.A. experience and, at the other end, one " flaviflora " was a small plant with a pink midrib. It seems likely that true *M. velutina* was present but had died down for the dry season (see below) and that the trimodal distribution results from backcrossing of the F_1 in both directions giving near-velutinas and near-flavifloras, each one introgressed by the other. Alternatively, differential viability such that near-specific and near-hybrid phenotypes survived better than intermediate phenotypes would produce the same result.

This cross has been made in both directions and F_2 and backcross families have been raised at the I.C.T.A. ; the identification of the Assam plants is therefore made with complete confidence even though one parent was perhaps not present (at least in flower) in the " pure " state.

General Remarks on Rhodochlamys

We have long known at the I.C.T.A. that members of the section Rhodochlamys are more swiftly and more severely affected by drought than are the Eumusas. Their natural distribution is mostly in the monsoon lands of India, Burma and Thailand and it is now apparent that their dry-season dieback is a normal seasonal adaptation to drought ; in this they stand in contrast to the great majority of wild bananas which live in places which are not subject to drought and in contrast also to the Eumusas of the monsoon lands which stand up during the dry season, though often in poor condition ; to this last statement *Musa flaviflora* is a partial exception ; it is roughly intermediate between Rhodochlamys and Eumusa in its drought reaction, just as it is intermediate in taxonomic characters and crossing relationships. The result of this behaviour in Rhodochlamys was that I did not see a single flowering plant in the course of the expedition, though I worked in country in which I would surely have seen two and perhaps as many as four species at a more favourable time of year.

The discovery of two Eumusa–Rhodochlamys hybrids in a few weeks of field-work implies that such hybrids must be very numerous. They could well give rise to considerable taxonomic confusion, especially in a group as poorly understood as Rhodochlamys. Collections based on segregates could easily be taken for new species unless they were extraordinarily well documented.

With these thoughts in mind, and having seen the collections in Herb. Calcutta and Herb. Singapore, I suspect that there may be as few as six species in the section, viz. :—*M. velutina* Wendl. and Drude and *M. sanguinea* Hook. in Assam (as understood by Cheesman, Kew Bull. **1949,** 133, 135, and ignoring for this purpose the confusion in nomenclature that will probably arise if the five imperfectly known species listed in Hooker, F. Br. India, **6,** 261 (1894) are ever identified) ; *M. ornata* Roxb. from the Chittagong Hill tracts and probably also Arakan, the hills of Bihar (Haines, For. Fl. Chota Nagpur, p. 536 (1910)) and possibly even peninsular India ; *M. rubra* Wall. ex Kurz from lower Burma and Thailand ; *M. laterita* Cheesm. from lower Burma and a probable new species* from North Borneo. The last is particularly interesting as the only non-continental Rhodochlamys known ; its affinities are evidently with *M. rubra* and *M. laterita.*

C. **Musa** section **Australimusa** *Cheesman*

16. **Musa maclayi** *F. Muell.*

F. v. Mueller ex Miklouho-Maclay, Proc. Linn. Soc. N.S.W. **10,** 348 (1885) ; F. v. Mueller ibid., 355 ; Cheesman, Kew Bull. **1950,** 28 ; Simmonds, Kew Bull. **1953,** 572.

M. erecta Simmonds, Kew Bull. **1953,** 571.

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* *Cuadra*, A 2288 ; *Cuadra*, A 2154 ; *Agama* and *Kadir*, A 2826 ; *Kadir bin Abdul*, A 2852 ; *Cuadra*, A 2347 ; *Keith*, A 1637 ; *Alenadra*, A 3022 ; *Puasa*, For. Dep. no. 4912 ; all from British North Borneo, in Herb. Singapore, and, curiously, all collected since 1947.

Banana Expedition Records :—

New Guinea : Limestone hill forests above Laupul, New Ireland, ca. 1000 ft. alt. (B.E. 11, 26.11.54 MP) ; Lae, New Guinea, locally very abundant (B.E. 44, 26.12.54, MPS) ; near the Zenag Pass, Lae to Bulolo, 3000 ft. alt. (B.E. 30.12.54, MPS).

Other Records :—

New Guinea :—Maclay coast (*N. de Miklouho-Maclay*, sketches and letter addressed to von Mueller, in Herb. Melbourne, TYPE) ; near Lae (coll. *J. S. Womersley*, 1952, I.C.T.A. Introduction 398).

Vernacular Name :—

New Guinea :—*Laplao* (New Ireland).

Remarks :—

This interesting species is now known from the eastern third of the north coast of New Guinea, one spot on New Ireland and in the Solomon islands. *Musa erecta* was founded on an I.C.T.A. plant from Buka in the Solomons and its reduction is based on the discovery that New Guinea plants were variable in sap colour, bract colour, bract persistence and numbers of flowers per bract. *Musa maclayi* was poorly described and its place of collection on the Maclay coast can not now be identified with certainty. Presumably it came from somewhere between Madang and Lae, at or very near the westernmost limit of the species.

The following slight amendments may be made to the description of *M. erecta* to cover the species in New Guinea : juice variably watery or yellowish or pale or bright pink ; bracts usually green without, rarely pale brownish ; male bud much reduced in size at fruit maturity, each bract then bearing as few as 8–10 flowers, bracts fully deciduous, fruits densely packed into a conical mass, bright orange at ripeness, the basal ones ca. 6 × 3 cm., upper ones shorter, obovoid, all tapered to the base, hardly pedicellate, and not or but slightly acuminate at the blunt apex.

Musa maclayi is of especial interest as the probable major (and perhaps even only) source of the *fehi* group of edible bananas. I saw *fehi* types in Samoa, New Ireland and New Guinea and was able to confirm their general similarity to *M. maclayi*, though they varied widely in fruit size and shape and their flowers were often more or less freakish. Their general though sparse distribution in what might be called semi-cultivation in New Guinea is of some interest in view of MacDaniels' statement (B. P. Bishop Mus. Bull. **190,** 45, 1947) that it was not known from that area. When the various *fehi* types have been collected together and studied as living plants in comparison with *M. maclayi*, an interesting nomenclatural problem may well arise ; if either *Musa fehi* Bert. ex Vieill. or *M. troglodytarum* L. or both turn out to be diploid cultigens of *M. maclayi* then there will be an obvious case for using the earlier cultigen name for the wild species even though commonsense revolts against such an action.

A note on **Musa jackeyi** *W. Hill* (*M. hillii* F. Muell.)

I am indebted to Mr. S. T. Blake of the Brisbane Herbarium for providing me with the following transcript of Hill's description (Rep. Brisbane Bot. Gdn. **1874,** 7) :—

Musa jackeyi, W.H.—Herbaceous ; stem black, simple, thirty to forty feet long, thickly clothed with sheathing petioles of the leaves ; leaves oblong, six to seven feet long, forming a tuft on the apex of the stem ; spadix erect, flowers compound, rising from the apex of the stem, each division enclosed in a spathe, with male flowers at the base, female or hermaphrodite ones at the upper end. Fruit short, horizontal, three to five cornered, with numerous seeds buried in pulp ; flowers yellowish, limph of the old stem red could be used as marking ink.

Hab.—In rich alluvial soil, on the banks of the Johnstone River. A new banana with black stem, named after the faithful and affectionate attendant of the explorer Kennedy.

This must surely be *Musa hillii* F. Muell., as von Mueller himself suspected (Fragm. Phyt. Austr. **9,** 169, 190 (1875)); the erect bunch and the red juice make the identity certain despite the statement about distribution of male and female flowers, which must be a gross error. We looked in vain for this interesting species in the type locality of *M. hillii*, the Daintree River ; Mr. S. E. Stephens, who has great knowledge and experience of the wild life of northeastern Queensland, told me that he had been looking for it many years without success though he had occasionally had verbal reports of a tall bush banana with an erect bunch. It is certainly now very rare and is probably extinct. It is clearly allied to *Musa maclayi* and would have priority as a name if identity could ever be proved. At present they are best regarded as distinct because Hill's plant had " female or hermaphrodite " flowers and the (probably typical) material of *M. hillii* grown and figured at Kew (Bot. Mag. **1895,** 7401) had hermaphrodite basal flowers. It also had conspicuously appendaged male flowers and von Mueller's description (based on Fitzalan's field notes on the TYPE—*Fitzalan*, Daintree River, Oct. 1875, in Herb. Melbourne) indicated that the plant " rarely makes suckers ".

In the male fertility of the female flowers, *Musa jackeyi* seems to be to *M. maclayi* what *M. banksii* is to *M. acuminata* and it is tempting to relate male fertility of the basal flowers to ecological conditions at the limits of range ; the behaviour might, for example, be of adaptive value under conditions where low population density was limiting for cross-pollination and therefore for seed-setting.

17. **Musa angustigemma** *Simmonds*
Kew Bull. **1953,** 573.

Banana Expedition Records :—

New Guinea : Saidor, ca. 50 mi. east of Madang (B.E. 25, 14.12.54, MPS) ; Madang to the foot of the Gogol Valley (B.E. 31, 16.12.54, MPS).

Other Records :—

New Guinea :—Foran, Madang (I.C.T.A. Intro. 395, received 1952 and since flowered) ; Jimmi Valley area, Western Highlands, 2000 ft. alt. (J. S. Womersley, *in litt.*).

Vernacular Name :—

New Guinea : *Sabulong* (Saidor, a generic name).

Remarks :—

This species apparently occupies a salient on the north coast of New Guinea ; it is abundant in the Madang area and extends southwards into the edge of the Highlands but disappears to the east before Lae and, to the west, before Wewak.

The following slight modifications of and additions to the original description were revealed by field investigations in New Guinea : The great height (commonly 6–7 m.) and slenderness of the pseudostems, together with the prevailingly greyish tone of the undersurfaces of the leaves gives the species a very distinctive facies when seen in bulk ; the petiole canal is sometimes closed, sometimes open and bounded by suberect wings ; female flowers are commonly fewer (ca. 10 per hand) than in the I.C.T.A. plants and ovule numbers may be as low as 100 per ovary ; the bracts are usually green with dull purple streaks outside, rarely brownish ; they are slowly but completely deciduous from the male axis, so that the male rachis is naked but each bud commonly has 4–5 raised bracts at its base ; the male bud is very long-lived and it persists in healthy condition (on a male axis up to nearly 3 m. in length) long after the fruits have rotted ; the fruits are rounded-angular in section, subsessile, bluntly bottlenecked at the tips, ca. 9 × 3 cm., with a thick bright orange skin enclosing 40–60 seeds in a brilliant yellow pulp ; the skin colours before the fruit is ripe and there is a transient soft-ripe stage followed by a drying-off *in situ* without any trace of dehiscence.

D. **Musa** section **Callimusa** *Cheesman*

18. **Musa violascens** *Ridley*

Ridley, Trans. Linn. Soc. (2), **3,** 384 (1893) ; Cheesman, Kew Bull. **1950,** 152 ; Simmonds, Malayan Nat. J. **10,** 7 (1955) (figs. 9–12).

Banana Expedition Records :—

MALAYA : Ulu Langat, Selangor (B.E. 56, 10.2.55, MPS) ; Cameron Highlands road above Tapah, Perak, up to nearly 4000 ft. alt. (no collections) ; Ulu Kinta (P), Ijok road north of Taiping and Grik area, Perak (no collections) ; Ginting Sempak, Selangor, from low altitudes to the top at about 1850 ft. alt. (no collections, P) ; Kuala Pilah road from Seremban, Negri Sembilan (no collections).

Other Records :—

MALAYA : many collections in Herb. Singapore from Perak, Selangor and Negri Sembilan ; in Pahang there are records from Fraser's Hill (11066 and *Corner*, s.n.), Kuala Lipis (*Ridley*, 11634), Talau River (*Ridley*, 2394, TYPE), and Bukit Chemaga, Cheger Perah (*Henderson*, 19485) (all in Herb. Singapore) ; two collections from Kelantan (*Haniff*, 10151, Kuala Krai and *Nur* & *Foxworthy*, 12135, Kuala Sameh) fit this species better than the following but are, unfortunately, not certainly determinable.

Vernacular Names :—

MALAYA : *Pisang utan* ("jungle banana"—Malay, a general generic name) ; *P. tok* (a specific name noted from a Sakai in the Grik area) ; *P. karok*, *P. noraka* (names in Selangor, fide *Tachun*, For. Dep. 39390 in Herb. Kepong ; the former is also used for *M. acuminata* subsp. *malaccensis*) ; *P. mamok* (Malay, used by a Sakai in Pahang, fide *Henderson*, 19485).

Remarks :—

I noted considerable variation in bract persistence and in the development of the violet flush on the bract tips ; the pale whitish-green fruits

were rarely (e.g. a plant at Ulu Kinta) flushed with purple on the flat faces but not on the angles or at the tips.

The distribution of this species is of interest in view of its close relationship to the succeeding species. It is common in Negri Sembilan, Selangor and Perak north to (but apparently not beyond) Grik ; it is present in Pahang but its limits there are not known ; there are two doubtful records for Kelantan and none for Trengganu or Johore ; thus it appears to be a plant of central Malaya, replaced to the east and south by *Musa gracilis*. It is therefore curious to find in Herb. Singapore a Ridley collection dated September 1893 from Puak, North Borneo, identified as *M. violascens* by the collector (and author of the species). The specimen as it stands is undeterminable and I suspect that it is *M. campestris* Beccari or possibly *M. gracilis*.

19. **Musa gracilis** *Holttum*

Holttum in Cheesman, Kew Bull. **1950,** 154 ; Simmonds, Malayan Nat. J. **10,** 7 (1955) (figs. 13–14).

Banana Expedition Record :—

Malaya : 20–31 miles on the Jerangau road, south of Kuala Trengganu (B.E. 70, 9.3.55, MPS) ; probably present in the north of Trengganu and in the Manek Urai district of Kelantan—non-flowering plants only were seen, apparently all too small and slender to be *M. violascens*.

Other Records :—

Malaya : several collections from Johore, all in Herb. Singapore (*Sinclair*, 39677, Gunong Pulai ; 13276, Pupayan River ; *Holttum* 9335, Kluang ; *Corner*, 30959, Gunong Panti) ; also from Trengganu (*Symington*, For. Dep. 26841, Sungei Paka, in Herb. Kepong) ; and in Malacca (Holttum, loc. cit.).

Thailand : Betong, Patani (far southern Thailand, adjacent to Kelantan) (*Kerr*, 7431, 31.7.–1.8.1923, in Herb. Mus. Brit. ; probably this species but the specimen is not a good one).

Vernacular Names :—

Malaya : *Pisang wek* (Malay, noted for B.E. 70 in Trengganu) ; *P. onik* (Malay, fide Symington on For. Dep. 26841) ; *P. kerteh* (Malay, noted in Kelantan for the plant presumed to be this species, see above).

Remarks :—

The Jerengau collection, B.E. 70, provides the following additions to the description of the species : female flowers, the styles green with white stigmas, staminodes green, ovules biseriate and about 180 per ovary ; fruit, the skin darkening somewhat from very pale green towards maturity, not yellow at ripeness, the flesh dead white ; seeds, as *M. violascens*, variably neatly cylindrical-truncate or ovoid-cylindrical and variable also as to size of the osteole to the perisperm chamber opposite the hilum ; male bud short-lived, dying off before fruit maturity, about 3 times as long as broad, strongly imbricate for nearly half its length and broadest about the middle ; bracts fully deciduous borne on rachis insertions which are much narrower and more widely spaced than in *M. violascens* ; male flowers, the anthers fawny, bearing chalky-white pollen.

The best key characters to distinguish this species from *M. violascens* are the small size of the plant, the few large uniseriate fruits and the

slender deeply imbricate male bud broadest about the middle with narrower bract insertions. The deciduousness of the bracts mentioned by Holttum is hardly diagnostic, because *M. violascens* occasionally has this character.

The species is distributed through southern and eastern Malaya up into far southeastern Thailand (if my determination of *Kerr* 7431 is correct). It must march or overlap with *M. violascens* over the greater part of the length of the Peninsula and a search for hybrids would be of great interest.

A Contribution to the flora of Nepal.*—When it is remembered that until the end of the second world war Nepal was virtually closed to foreigners, it is remarkable how much is known of the flora. This was due chiefly to the first botanists to visit the country, Francis Buchanan (afterwards Hamilton) who was in Nepal in 1802 and 1803, and Nathanial Wallich who spent a year 1820–1 in Katmandu and sent native collectors to other parts of the country, notably to the holy mountain Gossain Than. Both Buchanan and Wallich amassed large collections, and these provided the basis for D. Don's Prodromus Florae Nepalensis (1825) and Wallich's Tentamen Florae Napalensis (1824–6), and for many species described in Wallich's Plantae Asiaticae Rariores (1829–32) and Roxburgh's Flora Indica (1820 & 1824) and (1832). During his travels in Sikkim in 1848–9, J. D. Hooker collected in the adjacent part of eastern Nepal, while in the 1880's Duthie obtained plants from western Nepal ; these, together with the earlier collections, were included in Hooker's Flora of British India (1872–97). In 1907 I. H. Burkill followed Wallich's route to and from Katmandu with a short deviation on the way back, and he enumerated his collection in the Records of the Botanical Survey of India, IV. 59–140 (1910). And here the record ends until recent times, for though during the years 1927–37 seeds, plants and dried specimens were collected in Nepal by Sharma and Lal Dhwoj for presentation to H.M. George V. by H.H. The Maharajah of Nepal, no account of these collections has ever been published, while the list of Nepal plants published in Landon's Nepal (1928) was compiled from the earlier publications.

Since 1946 a number of expeditions have visited Nepal to collect plants and seeds, notably those of Polunin Sykes and Williams in 1952, and Stainton Sykes and Williams in 1954, both sponsored jointly by the British Museum and Royal Horticultural Society. In 1952 and 1953 the Fauna and Flora Research Society of Kyoto University sent expeditions to collect scientific material and to climb Manaslu, a peak of 8,125

* Fauna & Flora of Nepal Himalaya. Scientific Results of the Japanese Expeditions to Nepal Himalaya 1952–1953. Vol. I. Edited by H. Kihara. 390 pp., numerous illustrations. Fauna & Flora Research Society, Kyoto University 1955. Crown Quarto.

metres (26,800 feet). The reconnaisance party was in Nepal from September to December 1952, while in 1953 the collectors were in the field for six months, from March to August. The book now under review, excellently produced, written in English, and profusely illustrated with photographs, line drawings, and a map, presents the results of this enterprise. The greater part of the book (217 pp.) is an enumeration, principally by S. Kitamura, of the 960 species of flowering plants and ferns represented in the collection of some 5,000 specimens. It was to be expected that collecting in parts of Nepal not hitherto visited would add to the 1672 phanerogams listed in Landon's " Nepal ". And so it has proved, though no-one could have expected that so high a proportion as 300 out of the 960 species in this enumeration would be new records for Nepal, with 34 of the species new to science. A few of the latter are doubtfully distinct but the majority appear to be well-founded. Accounts of the Algae (37 pp.), Lichens (21 pp.) and Mosses (7 pp.) are given, while the botanical collector, S. Nakao, contributes 10 pages of ecological notes. There is an account of the itinerary by K. Imanishi, the leader of the expeditions, and chapters on the Dragonflies, Mayfly Nymphs, Butterflies, Rice Weevils, and Drosophila, the whole rounded off by indexes to the genera, and vernacular names. All concerned are to be warmly congratulated on the production of this valuable addition to our knowledge of the botany and zoology of Nepal—and not least on the rapidity with which the collections have been worked out and the results published.

J. Robert Sealy.

A Guide to the Maltese Flora.*—This little pocket book will undoubtedly meet the requirements of the majority of tourists who wish to know something, but not too much, about the wild flowers of Malta. It is unpretentious, and presumably inexpensive, with numerous line illustrations arranged into convenient categories to assist the novice with identifications. The text provides scientific names (alas, without authorities), and, where such exist, English and Maltese vernacular names ; the short notes accompanying each species tell us something of its distribution, or occasionally comment on a morphological peculiarity. It is a pity that the proofs were not more carefully checked, for misprints such as *Echballium* (for *Ecballium*), *Statchys* (for *Stachys*), *Mantha* (for *Mentha*), *Aphrys* (for *Ophrys*), *Uritca* (for *Urtica*) and *Ambroisa* (for *Ambrosia*) are not likely to aid the beginner in his search for scientific knowledge.

R. D. Meikle.

* Guide to the Flora of Malta, by Guido G. Lanfranco, Malta, 1955, 66 pages, 300 illustrations.

THE COMPARATIVE ANATOMY OF THE FLAGELLARIACEAE.

ELIZABETH SMITHSON

Introduction

This investigation was undertaken as a contribution to the broad survey of the anatomy of the monocotyledons now in progress at the Jodrell Laboratory, Kew.

The family Flagellariaceae comprises the genera *Flagellaria*, *Joinvillea* and *Hanguana* (*Susum*). The anatomy of *Flagellaria indica* L. and *Susum anthelminticum* Bl. has been investigated by Solereder & Meyer (1928) and the account following is based on a study of these same species together with two species of *Joinvillea*.

The preserved material of *Flagellaria indica* L., *Hanguana malayana* (Jack) Merr., and *Joinvillea borneensis* Becc. was supplied by Dr. R. E. Holttum and a portion of a leaf of *J. gaudichaudiana* Brongn. & Gris. was obtained from a specimen in the Kew Herbarium (Christopherson, 1286).

Preparation of material

Transverse and longitudinal sections were cut by hand and permanently stained in safranin and light green. For maceration, material was treated with a mixture of equal parts of 10% nitric acid and 5% chromic acid for 24 to 48 hours at about 16°C. During subsequent washing the epidermis usually separated off as a sheet, while a lens facilitated the separation of the vascular elements from their fibrous sheaths. After maceration, material was stained in either dilute Ehrlich's haematoxylin or dilute aniline blue and mounted in glycerine or glycerine jelly. Observation was particularly directed to the structure of the epidermis and the metaxylem. Drawings were made under a micro-projector.

General Morphology

The tough, though not rigid, aerial stem of *Flagellaria indica* L., which attains a height of several feet, bears smooth, thin leaves with a closed sheath 1–7 cms. long and a short petiole 3–10 mms. long, broadening into a horizontal, linear lamina which is 6–10 ins. long and about $\frac{1}{2}$ in. wide. The midrib is only slightly thicker than the rest of the lamina (Fig. 1b) but is extended at the apex into a tendril which helps to support the stem (Backer 1951).

The habit of *Joinvillea* is more grass-like, for the aerial stems, about 10 ft. tall, are very rigidly erect. The leaf has an open sheath broadening abruptly into a rough, plicate, linear lamina, 18 in.–24 in. long and about 2 in. wide, and though there is a pronounced midrib projecting on the adaxial surface (Fig. 1 c & d) there is no tendril (Backer 1951).

The habit of *Hanguana* differs greatly from that of the other genera. The leaves are attached at ground level to a short, stout, creeping stem; they stand almost erect, up to 4 ft. tall and 2 in. broad. Though the lower leaves are petiolate the upper ones are sessile, and show no abrupt transition from the very thick, spongy, sheathing base to the thick, broad lamina with an ill-defined mid-rib (Fig. 1a). When young, the leaves

are covered with crisp hairs, but later they are glabrescent. (Backer 1951).

Anatomy of the lamina

Epidermal cells generally are arranged in longitudinal files with the long axis of the cells parallel with the longitudinal axis of the lamina.

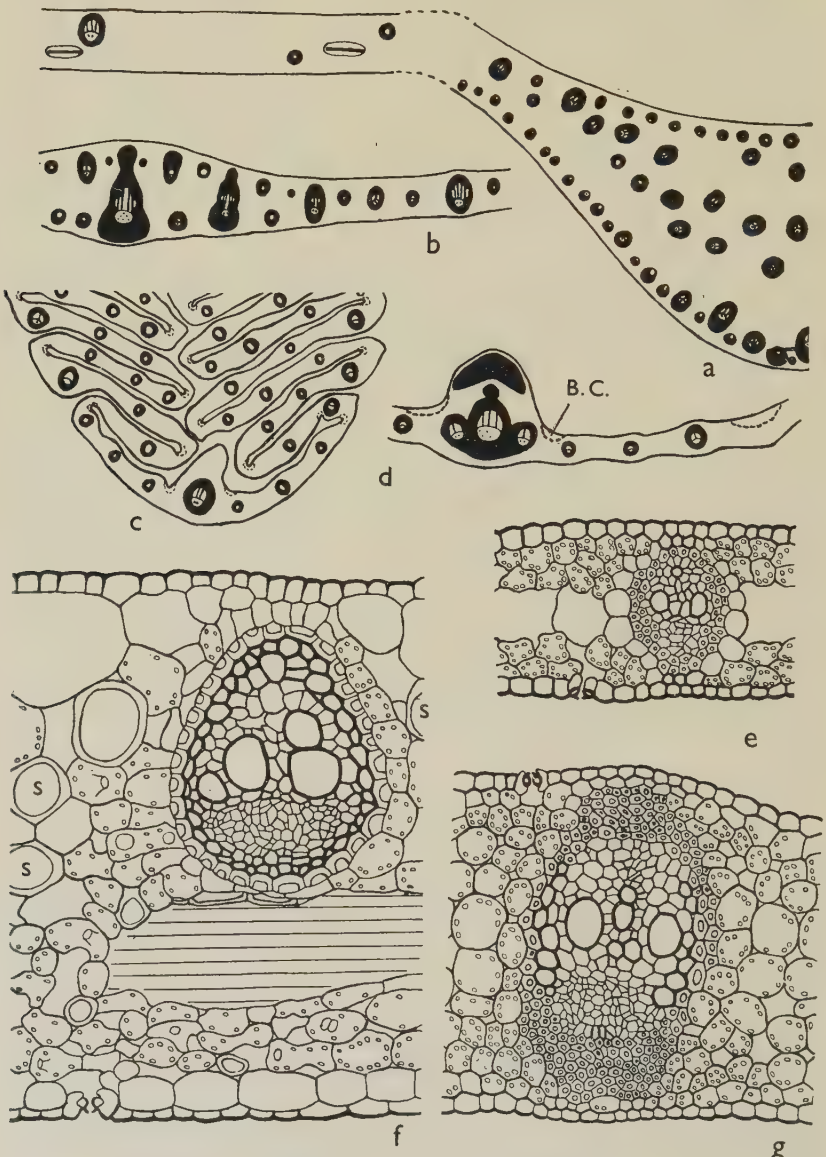

Fig. 1. T.S. lamina. a, *Hanguana* (× 10) ; b, *Flagellaria* (× 22) ; c, *Joinvillea borneensis* (× 37) ; d, *J. gaudichaudiana* (× 22) ; e, *J. borneensis* (× 185) ; f, *Hanguana* (× 185) ; g, *Flagellaria* (× 185), B.C. = bulliform cells, S = secretory cell. In a & f the horizontal lines indicate bundles cut longitudinally.

In *Flagellaria* the structure, including the distribution of stomata, is very similar on both surfaces of the leaf. In surface view (Fig. 2a) most cells appear longitudinally elongated with oblique cross walls (± 60 × 14μ)

but those proximal and distal to the guard cells are sometimes shorter. At intervals there are longitudinal zones (4–5 cells wide) of narrower cells which overlie the vascular bundles. The walls are relatively thin and straight.

The epidermal cells of *Joinvillea* (Fig. 2b & c) are arranged in very regular, longitudinal files. In surface view most cells are rectangular, some long ($\pm$ 90 $\times$ 20μ), others much shorter, almost square, the two types frequently alternating with each other in any one file. Longitudinal zones of narrower cells indicate the positions of the vascular bundles. The walls of these rectangular cells appear sinuous because of interlocking thickening ribs on contiguous walls and they are very thick, those of *J. gaudichaudiana* exceptionally so, particularly on the abaxial surface. Both surfaces of the leaf bear thick-walled spines (Fig. 2b, c & k). In *J. borneensis* the spines are most numerous opposite the strips of bulliform cells (Backer 1951) ; in *J. gaudichaudiana* they are also interspersed with spiny, multicellular, branching " hairs " whose terminal cells however are cylindrical and thin-walled (Fig. 2f, g, & k). Longitudinal zones of bulliform epidermal cells occur at intervals of about three bundles, the zones alternating on the adaxial and abaxial surfaces (Fig. 1c) thus producing the plicate vernation of the leaf. Their polygonal shape and straight walls (Fig. 2b) contrast sharply with the sinuous outlines of the rectangular epidermal cells.

The stomatal apparatus of *Flagellaria* (Fig. 1g, 2a) and *Joinvillea* (Fig. 1e, 2b & c) is similar to that of the Gramineae. The guard cells are 33μ long with a thickened flange forming a border round the pore. In median transverse section there is a slit-shaped lumen surrounded by thick walls ; in longitudinal section the guard cells are saddle shaped with the end portions of the walls much thinner than the median portions. In a transverse section of the leaf the guard cells are seen partly to overlie the thin walled, lateral, subsidiary cells. Stomata are most numerous on the abaxial side of the leaf of *Joinvillea*.

Most of the epidermal cells of *Hanguana* (Fig. 2d), in surface view, are very long ($\pm$ 130 $\times$ 14μ) and though those distal and proximal to the guard cells are shorter, there is no constant alternation of long and short types as in *Joinvillea* and there are more cells with oblique cross walls. Over the veins, and lining numerous depressions in both surfaces, are cells which appear polygonal in surface view. Sunk in the depressions are the thick-walled uni-seriate stalks of hairs (Fig. 2e) which at surface level dichotomise into tassels of long multi-cellular, uni-seriate thin-walled strands (Fig. 2d). All epidermal cells have very thick walls, which, in surface view, appear straight except for the large pits. Solereder & Meyer (1928) report that *Susum anthelminticum* has longer guard cells than *Flagellaria indica*, but all guard cells of the *Hanguana* species here described were of much the same length as those of the other genera (33μ). In contrast to the other genera, however, thickening occurs along the whole length of the longitudinal walls on either side of the pore, and the subsidiary cells are thick-walled and not overlain by the guard cells. Stomata occur on both surfaces, but very sparsely on the adaxial surface of *Hanguana*.

There is not a great deal of difference in structure and distribution of cells in the adaxial and abaxial parts of the mesophyll of the two sides of

the lamina except in *Hanguana* (Fig. 1f) where, adaxially, the hypodermal cells are much larger than those below the abaxial surface. In surface view, hypodermal cells are hexagonal, with their long axes lying transversely in the lamina. They contain fewer chloroplasts than the cells of the mesophyll within. In *Joinvillea* (Fig. 1e) they may become sclerosed in the vicinity of the vascular bundles, thus increasing the mechanical strength of the bundle sheaths.

The chlorenchyma below the hypodermis consists of almost spherical cells in *Flagellaria* ; in *Hanguana* the cells are more lobed and surround schizogenous intercellular spaces, which are particularly large in the mid-rib region. Cell diameter increases and chloroplast number decreases progressively towards the centre of the mesophyll tissue. There is clearer tissue-differentiation in *Joinvillea* for there are two layers of lobed chlorenchymatous cells both above and below the single median layer of very large, almost star-shaped cells whose contents appear to disintegrate with age, but whose peripheral siliceous deposit then fulfils a mechanical function.

Many mesophyll cells in *Hanguana* are completely filled with a brown secretion (S in Fig. 1f). Solereder & Meyer (1928) report the presence also of siliceous bodies in various parts of the lamina. These I have not observed except in the endodermoid sheaths of the bundles. In *Joinvillea borneensis* however, small globular bodies remained in the square epidermal cells after maceration in concentrated sulphuric acid, and the walls of the central mesophyll cells were heavily impregnated with silica. The walls of all epidermal and central mesophyll cells appeared to be siliceous in *J. gaudichaudiana*. Erdtmann (1952) refers to square silicon cells in the epidermis of both *J. ascendens* and *J. elegans*. In macerated material of *Flagellaria indica* amorphous strands represent the secretion normally contained in longitudinal ducts of the same diameter as a mesophyll cell. This secretory tissue is mentioned by Solereder & Meyer (1928).

The longitudinal veins of *Flagellaria* (Fig. 1b & g) and *Joinvillea* (Fig. 1d & e) consist of parallel collateral bundles with adaxial xylem and closed sclerenchymatous sheaths. In the biggest bundles the sheath adjoins the hypodermis. In *Joinvillea* the very largest bundles are associated with external longitudinal ribs on the abaxial surface and they lie very close to the bulliform cell strips on the adaxial surface (Fig. 1c & d). In *Hanguana* (Fig. 1a & f) even the largest bundles do not occupy the whole depth of the mesophyll, but lie in the adaxial half only, accompanied by many smaller bundles, often lacking xylem, which lie nearer the abaxial surface.

Joinvillea has a well defined mid-rib (Fig. 1c & d) containing a single large bundle which may be flanked by smaller ones. *Flagellaria* (Fig. 1b) and *Hanguana* (Fig. 1a) have a thick central region containing numerous small, peripheral bundles. *Flagellaria* has large bundles in addition, which, including their sheaths, in transverse section are seen to stretch right across the mesophyll but in *Hanguana* there are 2–4 layers of small median bundles surrounded by spongy mesophyll. Here the orientation of the xylem varies in different bundles, almost suggesting an isobilateral symmetry.

Surrounding the large vascular bundles in the lamina of *Flagellaria* (Fig. 1g) and *Joinvillea* (Fig. 1e) are sclerenchymatous sheaths which may be very thick outside the phloem and the xylem. In addition to this, *Joinvillea* has an outer, wide-celled, parenchymatous sheath with fewer chloroplasts than the rest of the mesophyll. *Hanguana* (Fig. 1f) differs from the other genera, for the inner sheath cells have much wider lumina and the outer sheath is endodermoid with the radial and inner tangential walls much thickened. In the small peripheral bundles in the mid-rib region the endodermoid sheath is replaced on the xylem side by parenchymatous cells devoid of chloroplasts, thus recalling the outer sheath of *Joinvillea*.

In all genera the longitudinal bundles, very numerous in *Hanguana*, are connected at intervals by short transverse strands, and lie in the centre of the mesophyll.

Protoxylem in all genera includes extremely long elements with spiral or, less commonly, annular thickening. *Hanguana* has no vessels, but in the assembly of tracheids there are protoxylem elements with close crossed spirals accompanied by reticulate and, less often, scalariform metaxylem elements, the latter being shorter and wider than the former. These attenuated metaxylem tracheids (1·4–5 mms. and 31–63μ wide) contrast sharply with the shorter vessel elements of the metaxylem in the other genera which are of the scalariform and pitted types rather than reticulate.

The metaxylem vessel elements of *Flagellaria* (0·08–1·4 mms. long and 9–62μ wide) have oblique multi-perforate cross walls with 4–5 (or fewer) trabeculae most often associated with scalariform pitting, or they have horizontal and uni-perforate cross walls when the pits are relatively narrower. *Joinvillea gaudichaudiana* has metaxylem elements attaining a length from 0·1–0·66 mms. and 12–50μ in width, those of *J. borneensis* are 0·16–0·8 mms. long and 30–50μ wide. Scalariform and reticulate thickening are usually associated with oblique multi-perforate cross walls with up to 24 trabeculae, while shorter pitted elements often have horizontal uni-perforate cross walls, but any element may have one oblique and one horizontal cross wall. These observations confirm the findings of Fahn (1954a) except that he found cross walls with more trabeculae. The discrepancy may be due to the fact that Y shaped trabeculae are here counted as one unit, not as two. Sometimes very narrow elements, always less than 15μ in width, are associated with the typical, wider metaxylem ; in *Flagellaria* they are 0·2–1·4 mms. long with spiral or reticulate thickening, in *J. gaudchaudiana* 0·1–0·66 mms. long, reticulate or scalariform ; in *J. borneensis* 0·16–0·5 mms. long, spiral or reticulate. Their cross walls are usually relatively short and oblique with 3–8 trabeculae, less often they are almost horizontal and uni-perforate.

In *Joinvillea borneensis* an element with the exceptional number of 52 trabeculae was found. This conformed to the " vessel-tracheid " type mentioned by Fahn (1954a). Phloem sieve tubes have been observed only in *Flagellaria* where they have long oblique cross walls which, along with the longitudinal walls, have numerous sieve fields.

In the parenchyma of both xylem and phloem of *Hanguana* there are scattered cells containing the same type of brown secretion as that found in the mesophyll.

Anatomy of the sheath

The epidermal cells of the sheath of *Flagellaria*, in surface view, are similar in form to those of the lamina, though larger on the abaxial (77 × 14μ) than on the adaxial (71 × 11μ) surface. *Joinvillea gaudichaudiana* has, on both surfaces, very thick-walled, long (77 × 14μ) and short, rectangular cells, alternating in longitudinal files. In *Joinvillea borneensis* the cells are shorter (63 × 17μ), but otherwise similar to those in the lamina. Bulliform cells are absent from the sheath and single-celled short spines on the abaxial surface of the sheath of *J. gaudichandiana* were the only epidermal outgrowths observed in the genus. The epidermal cells of the sheath of *Hanguana* are very long in surface view (180 × 14μ) except for those distal and proximal to the guard cells (29μ long) and those around the depressions containing the hairs, but in general their form is similar to that found in the lamina.

Stomata are present on both surfaces, in *Flagellaria* and *Hanguana* they are only slightly fewer on the adaxial when compared with the abaxial surface, but in *Joinvillea* there are very few on the adaxial surface. Guard cells are the same length as those of the stomata in the lamina (33μ).

The mesophyll of the sheath of *Flagellaria* shows a dorsiventral symmetry with small-celled chlorenchyma below the abaxial, and large-celled sclerosed parenchyma below the adaxial, epidermis. In *Joinvillea gaudichaudiana* there are 2–3 layers of very small cells immediately below the abaxial surface which initially are chlorenchymatous but become sclerosed with age. Below these cell layers there is a continuous sclerenchymatous plate in which some of the numerous bundles are embedded. Internal to the plate, in the middle of the leaf, is a large-celled parenchyma forming the ground tissue, but towards the adaxial side the parenchyma becomes sclerosed. *J. borneensis* has a wider-celled chlorenchymatous strip than *J. gaudichaudiana* near the abaxial surface, though the areas not associated with stomata soon become sclerosed and lose their chloroplasts. Internal to the abaxial chlorenchyma there are plates of narrow fibres continuous with the sclerenchymatous bundle sheaths. These plates are not so thick as those in *J. gaudichaudiana*. Lysigenous cavities are formed in the larger celled parenchyma in the middle of the leaf as it becomes disorganised (c in Fig. 2l). Towards the adaxial epidermis, however, the mesophyll cells are closely packed and may become sclerosed.

There is no clearly defined sheath in *Hanguana*, but the base of the leaf is very thick and spongy on account of the large, schizogenous, intercellular spaces in the very wide-celled, thin-walled parenchymatous mesophyll. Immediately within the epidermis on both surfaces are 2–3 closely packed layers of small-celled chlorenchyma with additional layers extending inwards between the bundles from the abaxial surface only. Solitary secretory cells are scattered throughout the mesophyll and starch grains are very numerous in the parenchymatous layer outside the endodermoid bundle sheaths.

Distribution of the vascular bundles varies in the different genera. *Flagellaria* (Fig. 2n) has a single layer of large bundles placed centrally

in the mesophyll. Each of these large bundles is separated from its neighbours by 2–3 small bundles lying slightly nearer the abaxial surface. Each large bundle is surrounded by a sclerenchymatous sheath 3–4 cells thick leaving a continuous parenchymatous mesophyll which is widest below the adaxial surface. *Joinvillea borneensis* (Fig. 21) has large and small bundles alternating in one layer near the abaxial surface, each with a continuous sclerenchymatous sheath 2–3 cells wide. *J. gaudichaudiana*

FIG. 2 a–d, Epidermis of lamina (× 185). a, *Flagellaria*, b, *Joinvillea borneensis*, c, *J. gaudichaudiana*, d, *Hanguana*, e, L.S. base of epidermal hair of *Hanguana* (× 185); f, g, & k, portions of epidermal hairs of *J. gaudichaudiana* (× 185); h, T.S. sheath of *J. gaudichaudiana* (× 22); j, T.S. aerial stem of *Flagellaria* (× 10); l, T.S. sheath of *J. borneensis* (× 22), c = lysigenous canal; m. T.S. main stem of *Hanguana* (× 10); n, T.S. sheath of *Flagellaria* (× 22).

(Fig. 2h), however, has 4–5 layers of bundles irregularly arranged and increasing in size towards the adaxial surface. The abaxial bundles are embedded in a common sclerenchymatous sheath, but towards the adaxial surface each bundle has its own sheath. *Hanguana* has many layers of bundles (7–10) ; the bundles increase in size towards the centre of the mesophyll. The large bundles are completely encircled by broad sclerenchymatous sheaths, but on the internal face of the small, peripheral bundles the sclerenchyma is replaced by parenchyma. In addition to a sclerenchymatous inner sheath each bundle has also an outer endodermoid sheath.

The xylem of the bundles in *Joinvillea* and *Flagellaria* is consistently adaxial, but, in *Hanguana*, its orientation varies in the sheath as it varies in the midrib of the lamina. There are annular as well as spiral tracheids comprising the protoxylem of *Flagellaria* and *Joinvillea* but only spiral in *Hanguana*. Metaxylem vessel elements in *Flagellaria* have scalariform thickening and are 0·45–0·9 mms. long and 13–40μ wide, often with multi-perforate, oblique, cross walls with 1–5 trabeculae, though uni-perforate, horizontal, cross walls also occur.

In *Joinvillea gaudichaudiana* longer vessel elements than those typical of the lamina metaxylem were found (0·68–1·34 mms. long and 25–75μ wide) though otherwise the structure was similar to that of the lamina. In *J. borneensis* the metaxylem of the sheath (0·3–0·79 mms. long and 13–40μ wide) is very similar to that of the lamina though cross walls were observed which had up to 26 trabeculae. Very narrow metaxylem elements with reticulate thickening were found ; in *Flagellaria* 0·25–0·8 mms. long, in *J. gaudichaudiana* 0·3–1·36 mms. long, in *J. borneensis* 0·16–0·4 mms. long, while the whole of the metaxylem of *Hanguana* is composed of reticulate or scalariform tracheids about 3 mms. in length.

Anatomy of the stem

Investigation was made into the structure of the aerial stem of *Flagellaria* and of the rhizome of *Hanguana* only.

The epidermal cells of the stem of *Flagellaria* are not arranged in such clear longitudinal files as in the leaf, but the elongated form of the cells when seen in surface view is similar to that of the leaf epidermis. In contrast to the latter, however, there is a very sparse distribution of stomata. In *Hanguana* the epidermal cells are shorter than in the leaf, branched hairs and depressions are present, but no stomata were observed.

Subjacent to the epidermis of *Flagellaria* (Fig. 2j) there are a few layers of parenchymatous cortex before the sclerosed ground tissue is reached, in which are embedded numerous small bundles each with its own still more highly sclerosed sheath. Though in these small bundles the xylem is internal to the phloem, in the larger, central bundles there is a more irregular orientation of the xylem. *Hanguana* (Fig. 2m) has a wide parenchymatous outer cortex with numerous small, scattered bundles, each surrounded by an inner multi-layered sclerenchymatous, and an outer single-layered endodermoid, sheath. A single-layered cylinder composed of cells with U-shaped thickenings separates the central area from the outer cortex. In the central area there develops an outer,

TABLE I

Species	Tracheid length	Vessel length	Thickening type	Perforation position	Perforation type	Trabeculae number
Leaf lamina						
Flagellaria indica ...	—	0·08–1·4 mm.	scalariform (some reticulate)	± horizontal + ± oblique	uni-perforate + multi-perforate	— 1–5
Joinvillea gaudichaudiana	—	0·1–0·66 mm.	scalariform (some reticulate)	± horizontal + ± oblique	uni-perforate + multi-perforate	— 2-24
J. borneensis ...	—	0·16–0·8 mm.	scalariform (some reticulate)	most oblique + some horizontal	multi-perforate + uni-perforate	5–13 —
Hanguana malayana ...	1·41–5·3 mm.	—	reticulate	—	—	—
Leaf sheath						
Flagellaria indica ...	—	0·45–0·9 mm.	scalariform (some reticulate)	most oblique + some horizontal	multi-perforate + uni-perforate	1–5 —
Joinvillea gaudichaudiana	—	0·68–1·34 mm.	scalariform (some reticulate)	most ± horizontal + some oblique	uni-perforate + multi-perforate	— 4–32
J. borneensis ...	—	0·3–0·79 mm.	scalariform (some reticulate)	± oblique + ± horizontal	multi-perforate + uni-perforate	2–26 —
Hanguana malayana ...	2·47–3·5 mm.	—	reticulate	—	—	—
Aerial stem						
Flagellaria indica ...	—	0·2–1·3 mm.	scalariform	most ± horizontal + some ± oblique	uni-perforate + multi-perforate	— 1–3
Rhizome						
Hanguana malayana ...	1·61–3·07 mm.	—	reticulate	—	—	—

many-layered sclerosed tissue in which large bundles are embedded. These bundles lack individual sheaths of cells with U-shaped thickenings though the bundles scattered in the parenchymatous zone have double sheaths like those of the outer cortical bundles. In the central part of the stem the bundles are arranged in small groups with the phloem of each bundle facing the centre of the group. By the fusion of such bundles a smaller number of amphivasal concentric bundles could be produced (Fahn 1954b). Scattered throughout the parenchyma of *Hanguana* are single cells filled with a dark secretion.

Protoxylem in *Hanguana* consists of long narrow tracheids usually with a crossed spiral thickening but in *Flagellaria* there are also elements with annular and single spiral thickening.

Metaxylem in *Hanguana* consists wholly of tracheids, mainly with reticulate thickening, which are 1·6–3·0 mms. and 37–62μ wide ; in *Flagellaria* it consists mainly of scalariform vessel elements 0·2–1·3 mms. long and 25–130μ wide, the shorter elements with more horizontal cross walls and often uni-perforate, the longer ones with slightly oblique cross walls and 1–3 trabeculae. Fahn (1954a) found longer vessel elements in *Flagellaria*.

A summary of the characteristics of the metaxylem of the different species is given in Table I.

Discussion

The considerable morphological differences between the genera comprising the Flagellariaceae (Henderson, 1954) are accompanied by notable anatomical differences.

The structure and arrangement of cells in the epidermis of the leaf of *Joinvillea* closely resemble those of the Gramineae and although *Flagellaria* lacks the undulating walls and file arrangement of epidermal cells, the structural relations of the guard cells and subsidiaries is similar. Erdtmann (1952) reports that the pollen of these two genera also resembles that of the Gramineae.

Hanguana differs from the other two genera particularly in the structure of the guard cells and their lateral subsidiaries. The stomatal apparatus and also the papillose chlorenchyma of the mesophyll recall those described by Fahn (1954b) for *Lomandra* in the Xanthorrhoeaceae. Erdtmann (1952) reports also a slight resemblance between the pollen of these two genera. The differences in bundle arrangement and sheaths and the lack of vessel elements in the metaxylem are of less taxonomic significance (Cheadle, 1942), but the overall anatomical differences are sufficient to lend weight to Erdtmann's suggestion that *Hanguana* should not be included with *Flagellaria* and *Joinvillea* in the Flagellariaceae.

Summary

The anatomical structure of the leaves of four species and the stems of two species included in the Family Flagellariaceae is described. *Hanguana* appears sufficiently different in its anatomy from the other two genera to support the view of Erdtmann (1952) that it should be removed from association with *Flagellaria* and *Joinvillea* in the Flagellariaceae.

Acknowledgments

My thanks are extended to the Director of the Royal Botanic Gardens, Kew, for hospitality at the Jodrell Laboratory, also to Dr. R. E. Holttum for providing material and for first-hand information regarding the morphology of the plants concerned. I am particularly indebted to Dr. C. R. Metcalfe for his advice and criticism during the course of this investigation.

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Theoretical Botany.*—The second volume of this important textbook is in the same excellent format as volume one. It is intended to complete the work in four volumes. The present volume is entirely devoted to the *Angiospermae*. Four chapters deal with the reproductive structures and behaviours found in the group in a general manner. A short chapter lists the families and is followed by three much longer chapters with details of many (and the larger, more important or interesting) of the families while others are treated more superficially. The sequence of families adopted is in various respects a new one and yet is an amalgam of the systems of Bentham and Hooker, of Engler and Prantl, and of Hutchinson. A final chapter deals with the principles of plant classification and with examples of well known systems. Some of the remarks in this last chapter are worth careful consideration by professional taxonomists.

On the whole, this has to be recognized as a first-class text-book. Various small details may be adversely criticized but there is a great deal that is new to botanical textbooks and this is true for the text as well as for the figures. These last, in particular, are of general outstanding merit. Most of them are apparently original. The outline drawings are clear, accurate, and apt while the photographs are well reproduced and truly illustrate the text.

W. B. Turrill.

* Textbook of Theoretical Botany vol. 2 by R. C. McLean and W. R. Ivimey-Cook, Longmans Green & Co. London, pp. 1071–2201, figs. 1042–2067 (1956) 90/- net.

Chromosome Botany.*—Chromosomes were figured by A. Schneider (1873), described by Strasburger (1875), and so named by Waldeyer (1888). Increased knowledge during the present century has led to a general recognition of their basic importance in the life of an individual plant or animal, in its heredity, and in its evolution. The results of research are published in numerous journals, in a great variety of languages, and with a somewhat frightening terminology. Hence there is a recurrent need of text-books with up-to-date accounts integrating and explaining the new and scattered data. The book here under notice should be read by all who are interested in any branch of modern botany. It is packed with information, some of it not previously published and much of it not hitherto introduced in perspective for the botanist who is not a specialist cytologist. There are seven chapters with the titles : the chromosomes, plants in groups, plants in space, plants in time, cultivated plants, ornamental plants, and the lessons of chromosome botany.

It may be that the classification of chromosomes into those of the ordinary complement and the extra chromosomes which are usually small and at meiosis only pair one with another is of considerable importance. The former are termed A chromosomes and the latter B chromosomes. The B chromosomes vary in number among different individuals, occur in both odd and even numbers, and may be absent in some plants of a population. They are active but have no specific action and would seem to be advantageous to some but not necessarily to all members of a population.

In his account of species and systematics the author is illuminating in parts but is not entirely fair to modern taxonomists. It is rather doubtful if he fully understands the aims, methods, materials, and outlook of many present-day systematic botanists. Nor does he mention and still less meet the valid criticisms taxonomists can level against a good deal of published plant cytology. It is strange that if systematic botany is founded on " fictions, errors and half-truths " (p. 32) its results have proved indispensable to every worker in any branch of botany, that it is used by cytologists who have proposed nothing better to take its place, that it is the basis of the " Chromosome Atlas ", and that its names appear on nearly every page of this book. Taxonomists welcome useful criticisms of their work, they are amused by exaggerations that show the ignorance of the critic.

The links between cytology and ecology and plant geography will increase as more wild species are examined cytologically, as more individuals of a species have their chromosomes examined, and, above all, as cytologists come to realize the wealth of tropical floras. While the cytological study of cultivated and that of wild plants should be complementary it is at present out of balance with the former outweighing the latter as indicated by the two chapters in this book dealing with field crops and garden plants. Dr. E. B. Ford contributes an appendix on evolutionary processes in animals, and there is a bibliography, divided to cover the separate chapters, and an index.

W. B. Turrill.

* Chromosome Botany, by C. D. Darlington, George Allen & Unwin Ltd., 1956, 16/- net, pp. 186.

NOTES ON AFRICAN ASCLEPIADACEAE—VIII*.

A. A. Bullock

It is always difficult to make a sharp distinction between taxonomy and nomenclature, but it is certain that the latter should be the handmaiden of the former. In the following discussions, I have reviewed various taxonomic treatments of *Sarcostemma* R. Br., where the nomenclatural position is clear, but in the case of *Hoodia* Sweet ex Decne. and *Decabelone* Decne., I have been more concerned with nomenclature ; in these latter cases the taxonomy is fairly clear and all authors have agreed concerning the circumscription of the genera.

Most of these notes arose from revisional work in connection with the various African floras now in preparation, or from bibliographical data encountered whilst preparing cards for *Index Nominum Genericorum*, which is in course of publication by the International Association for Plant Taxonomy (I.A.P.T.).

I am convinced that the two subfamilies *Periplocoideae* and *Asclepiadoideae* should be regarded as distinct families ; the family *Periplocaceae* was definitely proposed by Schlechter† (in Notizbl. Bot. Gart. Berlin, **9,** 23 : 1924) and Dr. Hutchinson informs me that he is accepting it in the second edition of his *Families of Flowering Plants*, now nearing completion.

Briefly, the two families are separable as follows :—

Filaments free from each other, anthers without horny wings ; pollen granular, in tetrads, transported on a spathulate carrier . . . . . Periplocaceae

Filaments united, often very short ; anthers with horny wings ; pollen in waxy masses, transported by means of a horny corpuscle to which they are attached by caudicles of varied form and size . . . . . Asclepiadaceae

The *Periplocaceae* are scarcely further divisible into subfamilies and tribes, but the *Asclepiadaceae* are readily divided into the small sub-family *Secamonoideae* (tribe *Secamoneae* auctt.) characterised by paired pollen-masses in each anther theca, and the much larger *Asclepiadoideae* (*Cynanchoideae* auctt.), in which the pollen masses are solitary.

The last is further divisible into tribes *Asclepiadeae*, *Marsdenieae*, *Gonolobeae* and *Ceropegieae* (incl. *Stapelieae*).

All the *Periplocaceae* are natives of the Old World, as are the *Secamonoideae* and *Ceropegieae*. The *Gonolobeae* are confined to the New World and *Asclepiadeae* and *Marsdenieae* occur in both hemispheres.

The *Ceropegieae* are distinguished at once particularly by their strictly valvate as opposed to contorted aestivation, though valvate aestivation occurs also in some *Marsdenieae* ; the *Gonolobeae* by the oblique or transverse (as opposed to longitudinal) dehiscence of the anthers. In the *Marsdenieae* the pollen masses are erect or ascending ; they are pendulous in the *Asclepiadeae*.

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* Continued from Kew Bull. **1955,** 626 (1956).

† Schlechter had used the name and the division of the family in earlier works. See, for example, in K. Schum. et Lauterb. Nachtr. Fl. Deutsch Sudsee, 351 (1905), in Mildbr. Wiss. Ergebn. Deutsch Zentral-Afr. Exped. 1907–8, **2,** 541 (1913) and in R. E. Fries, Wiss. Ergebn. Schwed. Rhod.–Kongo Exped. **1,** 264 (1916)—A.A.B.

Sarcostemma *R. Br.**

In these notes I am not especially concerned with the correct position of American species which have been referred to *Sarcostemma* by various authors, but it seems desirable to examine the situation at the generic level, particularly in view of Holm's (1950) monograph, which differs radically in generic concept from the treatments given by Bentham (1876), Schumann (1895), Vail (1897) and Schlechter (1914).

Robert Brown (1809) described† the genus *Sarcostemma* and in it he included " . . . . *Cynanchum viminale* Linn. [*sic*] ; a species from New Holland, and New Caledonia ; and *Asclepias viminalis* Linn.,‡ all of which I have examined." Doubtfully, he also referred four other species to *Sarcostemma*, one of which, now known as *Leptadenia pyrotechnica* (Forssk.) Decne., was responsible for the phrase " . . . . v. foliis oppositis distantibus " in his generic description. All the species concerned are indigenous in the Old World. At the same time Brown described *Oxystelma*, another Old World genus based upon *Periploca esculenta* Linn.

Kunth (1819) was the first author to describe New World species under the name *Sarcostemma*, and he was able to do so by making much of Brown's mistaken inclusion of " foliis oppositis distantibus " in his amended description. He also described another American genus, *Philibertia* H.B.K., based upon a single species, *P. solanoides* H.B.K.

Decaisne (1844) accepted Kunth's inclusion of American species in *Sarcostemma*, and still further amended Brown's description in order also to include *Philibertia* H.B.K. as a section of the genus, to which he assigned no fewer than eight species. The remaining eighteen American species, all with normal leafy stems, and eight leafless Old World species, constituted Decaisne's section *Eusarcostemma*. At the same time he maintained *Oxystelma* R. Br. as an Old World genus.

Kunze (1847) segregated the American species of Decaisne's *Sarcostemma* as a subgenus§ which he named *Ceramanthus*. It may be noted that the subgeneric epithet *Ceramanthus* was based upon *Sarcostemma variifolium* Decne. and *S. luridum* Kunze. Holm (1950) reduced the first of these to the synonymy of *Philibertia solanoides* H.B.K. and the second to *Sarcostemma elegans* Decne. ; he cited the latter as the type-species of subgenus *Ceramanthus*. Assuming the correctness of Holm's specific synonymy, it is clear that subgenus *Ceramanthus* Kunze must include all the American species of *Sarcostemma* R. Br. emend. Decne., and by inference Kunze confined " subgenus " *Eusarcostemma* to the Old World.

Bentham (1876), excluded all the American species from *Sarcostemma* and placed them under *Philibertia* H.B.K. ; his *Philibertia* therefore

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* An account of the species of this genus is in preparation, and I shall be glad to see new material from all parts of the Old World.—A.A.B.

† I am not sure what is the correct verb to use in this context ; certainly " erect " used by Holm and some other botanists and beloved of many zoologists seems to be a gross error.—A.A.B.

‡ I have been unable to trace this name, and am inclined to think that it is an error for *Euphorbia viminalis* Linn., upon which *Cynanchum viminale* (Linn.) Linn. f. is based.—A.A.B.

§ There is some evidence that at this date authors regarded the infrageneric category names " section " and " subgenus " as more or less synonymous.—A.A.B.

corresponds exactly to *Sarcostemma* subgen. *Ceramanthus* Kunze. He noted under *Philibertia*, " Genus nostro sensu a *Sarcostemmatibus* gerontogeis longe diversum ". Bentham also maintained *Oxystelma* R. Br. and noted that it is a " Genus *Philibertiis* typicis Americanis valde affine ", thereby implying that his *Philibertia* included an element which was not " typical ", *i.e.* the American part of *Sarcostemma* sect. *Eusarcostemma* Decne.

Fournier (1882) described the genus *Funastrum*, based upon *F. angustissimum* (Andersson) Fourn. from the Galapagos Islands, and a new species *F. suffrutescens* Fourn. from western tropical South America which appears to be better placed in the genus *Ditassa* R. Br. In his monograph for the *Flora Brasiliensis* (1885), Fournier had no species of *Sarcostemma* sect. *Philibertia* (H.B.K.) Decne. or of his own genus *Funastrum* to deal with and he, without any reference to the Old World species, adopted the name *Sarcostemma* in the sense of Kunth (1819) ; he also described a new monotypic genus, *Cystostemma*.

With K. Schumann's (1895) treatment of the *Asclepiadaceae* the name *Oxystelma* appeared in the American literature. He reduced *Philibertia* H.B.K. to the synonymy of *Oxystelma* R. Br. and used the name *Philibertia* for the remainder of the genus in Bentham's sense, that is, for the *Sarcostemma* of Fournier. He maintained *Funastrum* Fourn., *Cystostemma* Fourn. and *Sarcostemma* R. Br., limiting the last to the Old World species.

Vail (1897) first pointed out Schumann's misuse of the name *Philibertia*, and for it she substituted *Philibertella* Vail, in which she made new combinations for certain North American plants but did not cite a lectotype-species. She did, however, very strongly indicate that her *Philibertia* was based upon " *Sarcostemma* H.B.K. Nov. Gen. et Sp. 3, 193 (1819). As to the three species described and not R. Br. (1809) ". She also stated that *Philibertella* was to be taken as being equivalent to the *Philibertia* of K. Schumann, and she agreed with Schumann in placing *Philibertia* H.B.K. under *Oxystelma* R. Br. As lectotype of *Philibertella* Vail I propose *P. clausa* (Jacq.) Vail. According to Holm's (1950, p. 511) long list of synonyms, this species includes *Sarcostemma cumanense* H.B.K. and *S. pubescens* H.B.K. and would appear to cover all the requirements of a lectotype.

N. E. Brown (1902, 1908) was concerned only with Old World plants, and in particular with African plants ; he did, however, definitely state that in his view both *Sarcostemma* and *Oxystelma* are confined to the Old World.

Malme (1905) elevated Kunze's (1847) subgenus *Ceramanthus* to generic rank, and included in it *Philibertia* H.B.K. as well as *Philibertella* Vail and *Funastrum* Fourn. *Ceramanthus* Malme is clearly a *nomen superfluum*, but his classification of the plants concerned is exactly that of Bentham.

In various papers written during the first decade of this century, Schlechter indicated his acceptance of *Sarcostemma* R. Br., *Oxystelma* R. Br., *Philibertia* H.B.K., *Funastrum* Fourn. and *Philibertella* Vail, and he also described a new monotypic genus *Pentacyphus* Schltr. belonging to the *Oxystelma*-*Philibertia* group. In 1914, however, he reduced *Philibertella* to *Funastrum*, a course with which I am in agreement.

	R. Brown (1809, 1810)	Kunth (1819)	Decaisne (1844)	Kunze (1849)	Bentham (1876)
Old World	*Sarcostemma* R. Br.	—	*Sarcostemma* R. Br. emend. Decne. Sect. *Eusarcostemma* Decne. p.p.	—	*Sarcostemma* R. Br.
	Oxystelma R. Br.	—	*Oxystelma* R. Br.	—	*Oxystelma* R. Br
New World		*Philibertia* H.B.K.	*Sarcostemma* R. Br. emend. Decne. Sect. *Philibertia* (H.B.K.) Decne.		
		Sarcostemma R. Br. emend. H.B.K.	*Sarcostemma* R. Br. emend. Decne. Sect. *Eusarcostemma* Decne., p.p.	*Sarcostemma* R. Br. emend. Decne. SUBGEN. *Ceramanthus* Kunze	*Philibertia* H.B. emend. Benth.

I believe that Holm's (1950)* treatment of this group of genera at the specific level is probably more accurate than that of any of his predecessors, but his reduction of all of them to *Sarcostemma* cannot be maintained. Holm's use of the categories subgenus, section and series seems to indicate a most profound knowledge of the inter-relationships of the various groups of species concerned—a knowledge which neither Holm nor anyone else can pretend to possess, and concerning which Holm admits (p. 504) " I am not yet able to discuss satisfactorily the evolutionary relationships of the species of *Sarcostemma* . . . ". In these circumstances it is difficult to understand how his classification can be justified.

The historical sequence outlined above is shown briefly in the accompanying table, and the names in horizontal rows indicate fairly accurately the same taxa. Nomenclaturally and taxonomically Schlechter's (1914) classification seems to be preferable to any other, though it may, in certain circumstances, be found desirable to maintain *Philibertella* Vail.

The type species (holotypes or lectotypes) of the generic names involved in the above discussion are as follows :—

Sarcostemma R. Br. ... ... *S. viminale* (Linn.) R. Br. (*Euphorbia viminalis* Linn.)
Oxystelma R. Br. ... ... *O. esculentum* (Linn. f.) R. Br. (*Periploca esculenta* Linn. f.)

* I have assumed that this is an extension of Woodson's (1941) treatment of *Sarcostemma* in his account of the North American *Asclepiadaceae*. Woodson too readily carried out the reductions maintained by Holm, perhaps forgetting that the existence of apparently intermediate species does not necessarily require the union of otherwise readily distinguishable genera. It frequently happens that it is not possible to write down on paper the real differences between taxa of all ranks, and subsequent workers are often misled by the apparent lack of distinctivity in generalised descriptions.—A.A.B.

Fournier (1882, 1885)	Schumann (1895)	Vail (1897)	Malme (1905)	Schlechter (1914)	Holm (1950)
—	*Sarcostemma* R. Br.	*Sarcostemma* R. Br.	*Sarcostemma* R. Br.	*Sarcostemma* R. Br.	*Sarcostemma* R. Br. emend. Decne. Subgen. EUSARCOSTEMMA (Decne.) Holm
—	*Oxystelma* R. Br. emend. K. Schum.	*Oxystelma* R. Br. emend. K. Schum.	*Oxystelma* R. Br.	*Oxystelma* R. Br.	SUBGEN. *Oxystelma* Holm Sect. *Euoxystelma* Holm
Philibertia H.B.K.			*Ceramanthus* (Kunze) Malme	*Philibertia* H.B.K.	Sect. *Philibertia* Decne.
				Pentacyphus Schltr.	Sect. *Pentacyphus* Holm
Sarcostemma R. Br. emend. H.B.K.	*Philibertia* K. Schum. non H.B.K.	*Philibertella* Vail		*Funastrum* Fourn. emend. Schltr.	SUBGEN. *Ceramanthus* Kunze Ser. *Pannosa* Holm Ser. *Clausa* Holm Ser. *Cynanchoides* Holm
Funastrum Fourn.	*Funastrum* Fourn.	*Funastrum* Fourn.			Ser. *Angustissima* Holm
Cystostemma Fourn.	*Cystostemma* Fourn.				Ser. *Flava* Holm

Philibertia H.B.K. ... ... *P. solanoides* H.B.K.
Funastrum Fourn. ... ... *F. angustissimum* (Andersson) Fourn. (*Asclepias angustissima* Andersson).
Cystostemma Fourn. ... *C. umbellatum* Fourn.*
Philibertella Vail ... ... *P. clausa* (Jacq.) Vail (*Cynanchum clausum* Jacq.)
Ceramanthus (Kunze) Malme *Sarcostemma luridum* Kunze†.
Pentacyphus Schltr. ... *P. boliviensis* Schltr.

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Schlechter, R. 1914. Fedde, Repert. Sp. Nov. **13** (17/21), 279–287.
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* Holm (1950) regarded this as a synonym of *Sarcostemma flavum* Decne. and it was also included in the synonymy of *Funastrum flavum* (Decne.) Schltr. by Schlechter (1914).—A.A.B.

† Holm (1950) included this in his *Sarcostemma elegans* Decne., which he cited as the type of his subgenus *Ceramanthus*.—A.A.B.

The generic name Hoodia

The generic name *Hoodia* has always been attributed to " Sweet, Hort. Brit. ed. 2, 359 : 1830 " but Sweet gave no description, only referring to Masson's (Stapelieae Novae, 24, t. 40 : 1796) description of *Stapelia gordonii*. The first valid publication of *Hoodia* was by Decaisne (in DC. Prodr. **8,** 644 : 1844) and he cited in synonymy *Monothylaceum* G. Don (Gen. Syst. **4,** 116 : 1838) and *Scytanthus* Hook. (in Hook. Ic. Pl. **7,** tt. 605–6, 625 : 1844). As it appeared that *Hoodia* was an illegitimate name it became necessary to examine the two synonyms, with a view to either discarding them or to the conservation of *Hoodia*.

Don's publication of *Monothylaceum* occurred in a note under his description of *Stapelia gordonii*, with the words " differs from all other species, in the singular form of the corolla, and in the solitary follicles ; it therefore will hereafter constitute a new genus, which we would propose calling *Monothylaceum*, from its solitary follicles ". This is too nebulous to constitute a formal description, and since Don never did actually adopt the new name, it may be discarded as either a *nomen provisorum* or as a *nomen nudum*.

There is no doubt of the validity of publication of *Scytanthus* Hook. Under plate 605–6 of the *Icones* Hooker described the genus, with a new species, *S. currorii*, and under plate 625 he referred to *S. gordonii* (Masson) Hooker,—based upon *Stapelia gordonii*,—as the " original " species of the genus. I have therefore taken *Scytanthus* Hook. to be a nomenclatural synonym of *Hoodia* Sweet ex Decaisne.

Hooker derived the generic named from σκυμος, a shield, and ανθος, a flower, and the second letter of " *Scytanthus* " could be more correctly transcribed as " k ". I have, therefore, regarded *Scytanthus* as no more than an orthographic variant of *Skytanthus*, a generic name validly published by Meyen in 1834 (Reise um die Erde, **1,** 376 : 1834), for a genus of *Apocynaceae*.*

The generic name *Hoodia* may be retained, but the correct citation becomes :—

Hoodia *Sweet ex Decne.* in DC. Prodr. **8,** 644 (1844).

Monothylaceum G. Don, Gen. Syst. **4,** 116 (1837) ; nom. nud. provis.

Scytanthus Hook. in Hook. Ic. Pl. **7,** tt. 605–6, 625 (1844) ; non *Skytanthus* Meyen, 1834.

H. gordonii (*Masson*) *Sweet ex Decne., l.c.*, typus nominis generici. Species 15–20, Africae tropicae et australis incolae.

Decabelone Decne. *versus* Tavaresia Welw.

The typification of generic names in connection with the preparation of data for the *Index Nominum Genericorum* has already led to a number of disturbing nomenclatural facts ; the one now under consideration is con-

* It is of interest to note that Harms (in Engl. et Prantl, Naturl. Pflanzenf. ed. 2, **16b,** 281 : 1935) discarded *Scytanthus* Liebmann (1847) in favour of *Bdallophyton* Eichler (1889) for the same reason ; he had evidently overlooked *Scytanthus* Hook. (1844).—A.A.B.

cerned with the modern definition of valid publication. Before the era of International Rules, all kinds of publication were accepted, the main criteria of validity being that there should be either a description or distributed specimens, or even a manuscript.

The generic name *Tavaresia* appeared in an obscure list of Angolan plants, prepared by Welwitsch (1854), but apart from its reference to the *Asclepiadaceae* and a statement that the flowers are tubular, there was no description. The name was not included in Bentham's account of the family in the *Genera Plantarum* (1876), or in Schumann's account in the *Pflanzenfamilien* (1895) ; it was resuscitated by Hiern in his *Catalogue* of Welwitsch's plants (1898) and a description was at length supplied by N. E. Brown in the *Flora of Tropical Africa* (1903). Since 1903 it has been universally accepted by all authors. In the meantime, however, Decaisne had described the genus *Decabelone*, and there is no doubt whatever that his *D. elegans* and Welwitch's *Tavaresia angolensis* are identical, although they are based upon different types. It is clear, therefore, that the name *Decabelone* must be restored ; there is no justification for adding *Tavaresia* to the list of *nomina conservanda*.

The relevant references to the literature are given below, but these do not constitute an exhaustive bibliography :—

Decabelone *Decne.* in Ann. Sc. Nat. Sér. 5, **13,** 404, t. 2 (1871) ; Benth. in Benth. et Hook. f. Gen. Pl. **2,** 784 (1876) ; K. Schum. in Engl. et Prantl, Naturl. Pflanzenf. **4** (2), 275 (1895).

Tavaresia Welw. in Bol. e Ann. Cons. Ultramar. No. 7, 79 (1854), nomen ; Hiern in Cat. Afr. Pl. Welw. **1,** 697 (1898), nomen ; N. E. Br. in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 493 (1903), descr., et in Thiselton Dyer, Fl. Cap. **4** (1), 901 (1909) ; White et Sloane, Stapelieae, ed. 2, **3,** 1099 (1937).

D. elegans *Decne. l.c.* ; Hook. f. in Bot. Mag. t. 6115 (1874) ; K. Schum. *l.c.*, f. 83C–D ; typus nominis generici.

Tavaresia angolensis Welw. *l.c.*, nomen ; Hiern, *l.c.*, nomen ; N. E. Br. in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 493 (1903), descr., excl. syn. *Decabelone grandiflora* K. Schum. ; White et Sloane, *l.c.* 1101, cum fig.

Huernia tavaresii Welw. *l.c.* No. 24, 252 (1856), nomen.

Stapelia digitaliflora Pfersdorf ex Decne. *l.c.*, in syn.

Decabelone sieberi Pfersdorf ex Hook. f. *l.c.*, sub. t. 6115, syn. in obs.

D. barklyi *Thiselton-Dyer* in Bot. Mag. t. 6203 (1875), et in Journ. Linn. Soc. Bot. **15,** 249, t. 5, f. 4 (1876) ; N. E. Br. in Hook. Ic. Pl. **20,** sub t. 1905 (1890) ; K. Schum. *l.c.* ; Schltr. in Journ. Bot. **36,** 476 (1898) ; W. Wats. in Gard. Chron. Ser. 3, **27,** 211, f. 67 (1900).

Tavaresia barklyi (Thiselton-Dyer) N. E. Br. in Thiselton-Dyer, Fl. Trop. Afr. 4 (1), 494 (1903), et in Thiselton-Dyer, Fl. Cap. **4** (1), 901 (1909) ; Phillips in Fl. Pl. S. Afr. t. 475 (1932) ; White et Sloane, *l.c.* 1103.

D. grandiflora *K. Schum. l.c.* ; N. E. Br. in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 494 (1903), in syn.

Tavaresia grandiflora (K. Schum.) Berger, Stap. und Klein. 45 (1910) ; White et Sloane, *l.c.* 1106.

Marsdenia *R. Br.*

The genus *Marsdenia* was described by Robert Brown (1809) and in it he included eight species, divided into two groups distinguished by the character " *Stigma muticum* " (six species) and " *Stigma rostratum* " (two species). The genus was named in honour of " William Marsden, Esq., F.R.S. . . . . author of a very judicious and learned *History of Sumatra.*" In his book, Marsden drew attention to some few of the plants of Sumatra, including Tarram akkar, " said to afford the best indigo in that island ". This plant was described by Brown as *Marsdenia tinctoria* and it was included in the first group, which he labelled " Marsdeniae verae ".

The other five species of this group were *M. clausa* R. Br. from Jamaica and four new species from tropical Australia—*M. velutina*, *M. viridiflora*, *M. suaveolens* and *M. cinerascens*. The two species with " *Stigma rostratum* " were *M. erecta* (Linn.) R. Br. from the Mediterranean region and *M. rostrata* R. Br. from extra-tropical Australia.

With such a wide distribution it is not surprising that *Marsdenia* is heterogeneous and the choice of a lectotype-species of a genus, to which a large number of species from the tropics and subtropics of both hemispheres has been referred, presents some difficulty. The obvious choice, however, is *M. tinctoria*, the plant most closely associated with William Marsden. It belongs to a very small group of Asiatic species characterised by the presence of a dye, which causes them to dry bluish-black, and by a narrow, elongated, thyrsiform inflorescence of very small and numerous flowers. Such inflorescences do not occur in any Australian, African or American species and it seems advisable to limit the genus severely. In particular, the African, Australian and American species should be referred to other genera, whilst *M. erecta* should be returned to Grisebach's monotypic genus *Cionura* as *C. erecta* (Linn.) Griseb.

In the following pages I have transferred some species of *Marsdenia* of the *Flora of Tropical Africa* to *Anisopus* N. E. Br. and have resuscitated the genus *Dregea* E. Mey. Elsewhere (p. 287) I have re-established Robert Brown's genus *Leichardtia* for a few species from Australia and New Caledonia.

Anisopus *N. E. Br.*

N. E. Brown's failure to realise the generic unity of his *Anisopus mannii* and such species as *Marsdenia rostrifera* and *M. efulensis* was due to his misinterpretation of the tubercle or cushion at the sinus of the corolla lobes as an outer corona. Such outgrowths of the corolla occur spasmodically throughout the family, and are not as a rule of generic importance ; they can be easily overlooked when dissecting a dried flower, since they are mere swellings of the fleshy corolla-tissue.

Anisopus, however, is easily recognisable by its thin-textured, elongated, horizontally opposed follicles ; the inflorescences are opposite and axillary, with one peduncle of each pair somewhat longer than the other,

though both may be much reduced ; the flowers are more or less glabrous outside, and velvety-papillose inside. The leaves, which are extremely variable in size, are of a very deep green colour, and usually dry bright green, often with the yellow tinge associated with aluminium accumulation. The species occur only in closed rain forest, and the flowers are deep crimson maroon tinged with green, or mainly green, or yellow, in contrast to the white or cream flowers of *Marsdenia* and its allies.

Anisopus mannii *N. E. Br.* in Kew Bull. **1895,** 259 (1895), et in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 416 (1903) ; Oliv. in Hook. Ic. Pl. t. 2453 (1896) ; K. Schum. in Engl. et Prantl, Naturl. Pflanzenfam. Nachtr. **2–4,** 288 (1897) ; Hutch. et J. M. Dalz. Fl. W. Trop. Afr. **2,** 61 (1931) ; typus nominis generici.

Marsdenia efulensis N. E. Br. in Hook. Ic. Pl. t. 2497 (1896), et in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 423 (1903) ; Hutch. et J. M. Dalz. *l.c.* 60.

M. rhynchogyna K. Schum. in Engl. Bot. Jahrb. **23,** 234 (1896).

M. bicoronata K. Schum. *l.c.* 235.

Anisopus bicoronatus (K. Schum.) N. E. Br. in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 416 (1903) ; Hutch. et J. M. Dalz. *l.c.*

There are certain small differences between specimens which have been referred to *Anisopus mannii* and *Marsdenia efulensis* respectively, but they are insufficient for specific separation. Specimens referred to *M. efulensis* are usually weaker and less floriferous, often with longer, more slender pedicels ; such variation may be associated with the degree of exposure or shade. There is enormous variation in leaf-size and shape and the lamina may be acute, truncate, rounded or deeply cordate at the base, but is always abruptly and shortly caudate-acuminate at the apex. The venation also is characteristic.

Sierra Leone. April (fl.), *Afzelius* s.n. (*non visi* ; *holotypus* : *Marsdenia bicoronata* K. Schum., *ex herb. Berol.*).

Gold Coast. Banka, Ashanti, in closed forest ; " climber " ; March 1930 (fl.), *Vigne* 1865. Begoro, Akim, 1000 ft., at edge of evergreen forest ; " creeper with stems hanging down, flowers yellowish-green, in clusters in the leaf axils, oozing nectar from the centre" ; March 1932 (fl.), *Irvine* 1813.

Nigeria. Akassa, at the mouth of Niger River ; 1902 (fr.), *Dutton* 32. Okomu Forest Reserve, Benin, in evergreen forest ; " climbing shrub, leaves cordate and opposite, flowers in leaf-axils " ; March 1948 (fl.), *Akpabla* 114. Oban ; 1912 (fl.), *Talbot* 1684.

French Cameroons. Lolodorf ; July (fl.), *Staudt* 356* (*syntypus* : *Marsdenia rhynchogyna* K. Schum., *in herb. Kew.*). Rain forest at Dengdeng, 250 km. north-east of Yaunde ; March 1914 (fl.), *Mildbraed* 8652. Mbussa, 6°N. 14° 20′E., 800–900 m. ; April 1914 (fl.), *Mildbraed* 9053. Efulen, in forest ; " twining vine, juice milky, flowers green " ; Sept. 1895 (fl.), *Bates* 378 (*holotypus* : *Marsdenia efulensis* N. E. Br., *in herb. Kew.*).

Spanish Guinea. Corisco Bay, 1°N. ; " climbing, 10–15 ft. high " ; Sept. 1862 (fl.), *Mann* 1862 (*holotypus nominis specei, in herb. Kew.*).

Belgian Congo. Yangambi, 8 km. north of Yasuka ; Febr. 1937 (fl.), *Louis* 3238. Yangambi, Esalé Island ; April 1938 (sterile), *Louis* 10860. Yangambi, Isalowé ; March 1939 (fl.), *Louis* 13897. Iteko, Yombao road ; March 1939 (fl.), *Louis* 14030. [? Yangole, 20 km. north of Yangambi ; Oct. 1938 (sterile), *Louis* 11957.]

* The number on the Kew specimen ; it was cited by Schumann as 376.—A.A.B.

Anisopus rostriferus (*N. E. Br.*) *Bullock*, comb. nov.

Marsdenia rostrifera N. E. Br. in Kew Bull. **1906,** 250 (1906).

M. batesii S. Moore in Journ. Bot. **64,** 40 (1926).

This species differs from *A. mannii* chiefly in its much larger flowers on stouter, longer pedicels. The Kew specimen of *Marsdenia batesii* was sent to N. E. Brown by Spencer Moore in 1920, with the request that he might examine " this species of *Anisopus* ". Brown failed to find the so-called outer corona and replied that the plant was a species of *Marsdenia*, which Moore proceeded to describe as new. It differs from the type of the species only in its larger, more deeply cordate and relatively broader leaves.

Gold Coast. Aburi ; " climber with dark crimson–maroon flowers with odour of native ' stink fish ' ; corolla thickly fleshy " ; Sept. 1905 (fl.), *Johnson* 1078 (*holotypus in herb. Kew.*).

French Cameroons. Yaunde, Bitye ; *Bates* 1427 (*typus* : *Marsdenia batesii, in herb. Mus. Brit., dupl. in herb. Kew.*).

Dregea *E. Mey.*

The genus *Dregea* was described by E. Meyer (1837) for the single South African species *D. floribunda* E. Mey. [*Marsdenia floribunda* (E. Mey.) N. E. Br.] ; it was maintained by Decaisne (1844), who added to it the Arabian species *D. arabica* Decne., and by Bentham (1876) who included in it " Species 6 v. 7, Africae tropicae et australis, Indiae orientalis et Archipelagi Malayani incolae ". Bentham's treatment included *Hoya* sect. *Wattahaka* Decne., which itself included *Pterygocarpus* Hochst. from Africa and two Indian species. Schumann (1895) divided *Dregea* into three sections, *Eudregea*, *Wattakaka* (based upon *Hoya* sect. *Wattahaka* and *Wattakaka* Hassk.) and *Pterygocarpus*. Schumann also described *Traunia*, with the single species *T. albiflora* K. Schum. (here included in *Dregea schimperi*), and on this I have based *Dregea* subgen. *Traunia*, including three species.

From Decaisne's description, I am satisfied that *Dregea arabica* Decne., hitherto known only from *Botta's* imperfect specimen in the Paris herbarium, and *Marsdenia robusta* Balf. f., from the island of Socotra, are conspecific.

The African species are listed below, and I have given also a key for their identification ; the most obvious characters are provided by the follicles, but these are rarely present at the same time as the flowers, which provide the characters by which the two subgenera may be separated.

The Asiatic species (of which *D. sinensis* Hemsl. and *D. volubilis* (Linn. f.) Benth. ex Hook. f. are perhaps the best known) number three or four, and correspond exactly to *Wattakaka* Hassk. ; there are also three or four species in Madagascar. The genus does not occur in the New World.

Dregea *E. Mey.* Comm. Pl. Afr. Austr. 199 (1837) ; Decne. in DC. Prodr. **8,** 618 (1844) ; Benth. in Benth. et Hook. f. Gen. Pl. **2,** 775 (1876) ; Hook. f. Fl. Brit. Ind. **4,** 46 (1883) ; K. Schum. in Engl. et Prantl, Naturl. Pflanzenfam. **4** (2), 293, f. 90 A–B (1895) ; Trimen,

Handb. Fl. Ceylon, **3,** 160 (1895) ; Costantin in Lecomte, Fl. Gén. Indo-Chine, **4,** 114 f. 16 (1–4) (1912) ; Ridley, Fl. Malay Penins. **2,** 387(1923), partim.*

Pterophora Harvey, Gen. S. Afr. Pl. 223 (1838).

Pterygocarpus Hochst. in Flora, **26,** 78 (1843).

Hoya sect. *Wattahaka* Decne. in DC. Prodr. **8,** 639 (1844).

Wattakaka Hassk. in Flora, **40,** 99 (1857) ; Stapf in Bot. Mag. sub t. 8976 (1923).

Traunia K. Schum. in Notizbl. Bot. Gart. Berlin, **1,** 22 (1895), et in Engl. et Prantl, Naturl. Pflanzemfam. **4** (2), 287, f. 85 T–V (1895).

[*Marsdenia* (non R. Br.) ;—N. E. Br. in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 417 (1903), partim, et in Thiselton-Dyer, Fl. Cap. **4** (1), 774 (1908) ; K. Schum., in Engl. et Prantl, Naturl. Pflanzenfam. **4** (2), 291 (1895), quoad spp. afric.–arab. tantum ; Hutch. et J. M. Dalz. Fl. W. Trop. Afr. **2,** 60 (1931), partim ; Phillips, Gen. S. Afr. Fl. Pl. ed. 2, 617 (1951), quoad spp. afr. austr.]

The Afro-Asiatic species are divisible into subgenera as follows :—

Corolla more or less rounded in bud, the lobes later spreading or reflexed, ovate or rotund, not twisted and not parallel-sided . . . . . Subgen. *Dregea*

Corolla markedly acute in bud, the lobes later spreading, narrowly oblong, parallel-sided and twisted . . . . . Subgen. *Traunia*

Dregea subgen. **Dregea** E. Mey. (1837).

Pterophora Harvey ; *Pterygocarpus* Hochst. ; *Hoya* sect. *Wattahaka* Decne. ; *Wattakaka* Hassk. ; *Marsdenia* auctt., partim, non R. Br.

Species circiter 15, Africae, Madagascari et Asiae tropicae incolae.

Key to the African species of Dregea subgen. Dregea

Follicles not winged, shining, often mottled green and brown ; calyx-lobes lanceolate, acute, somewhat foliaceous ; corolla about 2 cm. in diameter, lobes densely villous all over the inner surface . . . . . *D. macrantha*

Follicles markedly longitudinally winged, wings straight, slightly undulate or intricately convolute (forming a thick spongy outer layer) ; corolla never more than 1·5 cm. in diameter ; calyx lobes small, obtuse, not at all foliaceous :

Wings of the follicles 4, straight or very slightly undulate ;

Follicles up to 11 cm. long, glabrous and shining when mature, the wings stiffly coriaceous, 1 cm. or more wide near the base, tapering to a triangular apex overtopping the apex of the follicle which thereby appears to be 4-lobed ; corolla about 1·2 cm. in diameter, the lobes velvety tomentose all over the inner surface . . . . . *D. rubicunda*

Follicles scarcely exceeding 6 cm. long, often smaller, the wings never overtopping the apex :

Follicles glabrous when mature, the wings somewhat membranous in texture, slightly undulate, about 5 mm. wide near the base, all equally developed ; corolla 5–6 mm. in diameter, the lobes velvety papillate on the inner surface *D. floribunda*

Follicles shortly and stiffly pubescent, the wings very unequally developed, tending to curl longitudinally and somewhat woody in texture ; corolla very small ; inflorescences congested, almost sessile, pedicels obsolete *D. stelostigma*

* Ridley listed two species, one of which is better placed as follows :—
Dittoceras stellaris (*Ridley*) *Bullock*, comb. nov.—*Marsdenia stellaris* Ridley in Journ. Fed. Malay States Mus. **5,** 40 (1914).—*Dregea stellaris* (Ridley) Ridley, Fl. Malay Penins. **2,** 387 (1923).

Wings of the follicles more than four, not longer than the body, often shorter (and then the follicles appearing to be beaked), soft in texture and intricately convolute, often densely cristate and forming a spongy mass more than 1 cm. thick ; follicles about 7 cm. long ; corolla about 1·2 cm. in diameter, the lobes villous only near their margins inside . . . . . *D. abyssinica*

Dregea macrantha *Klotzsch* in Peters, Reise Mossamb. Bot. 272 (1861) ; K. Schum. in Engl. Bot. Jahrb. **28,** 460 (1900), et in Engl. Pflanzenw. Ost Afr. **C,** 326 (1895).

Periploca petersiana Vatke in Oest. Bot. Zeitschr. **26,** 147 (1876).

Marsdenia zambesiaca Schltr. in Journ. Bot. **33,** 338 (1895) ; N. E. Br. in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 420 (1903).

M. macrantha (Klotzsch) Schltr. in Engl. Bot. Jahrb. **51,** 143 (1913).

Kenya Colony. Lorgasailie Plains, 3400 ft., common in ravines ; " climber, no latex " ; Aug. 1943 (fl.), *Bally* 2669.

Tanganyika Territory. Mpwapwa ; Jan. 1930 (fl.), *Hornby* 152. Mbiriri, North Kilosa, 2800 ft. ; Jan. 1931 (fl.), *Haarer* 1950. Manyoni, 4200 ft., among rocks ; " rambling climbing herb with flowers one inch in diameter " ; Dec. 1931 (fl.), *Burtt* 3448. Mpwapwa, in deciduous thicket on red gravel soil with *Commiphora*, *Cordyla* and *Acacia* ; Nov. 1934 (fr.), *Hornby* 152. Shinyanga, 3800 ft., common in *Commiphora–Lannea* hardpan thickets ; " climbing plant with latex " ; Dec. 1935 (fl.), *Burtt* 5306. Kanje Estate, Tanga District, 100 ft. ; Nov. 1951 (fl.), *Faulkner* 839 (with material in spirit).

Angola. Between Kalolo and the Habringa River, by the Kubango River, Amboella District, 1100 m. ; Nov. 1899 (fl.), *Baum* 450.

Northern Rhodesia. Gwembe Valley, 1 mile south of Mambo's Village, in *Adansonia–Copaifera mopane–Combretum imberbe* open woodland on alluvium overlying karroo mudstone ; " twiner 4 m. high, stems woody ; leaves dark green ; pods mottled green and brown ; copious latex from stems and pods " ; March 1952 (fr.), *White* 2356 (with fruit in spirit).

Southern Rhodesia. Victoria Falls ; " waxy, pubescent flowers, cream-coloured, scented " ; *Allen* 84. Melsetter hot springs ; Nov. 1952 (fl.), *Chase* 4717. West Nicholson, Gwanda, on Liebig's Ranch ; Oct. 1952 (fl., fr.), *Plowes* 1518. Chipisa hot spring, Sundi River, Zambesi Valley, 1500 ft. ; Nov. 1953 (fl.), *Wild* 4250 (with material in spirit). Ndanga, 1200 ft. ; Dec. 1951 (fl.), *Wild* 3715 (with material in spirit). Marandellas and Sabi District ; Nov. 1931 (fl.), *Myres* 604.

Nyasaland. Chiromo ; Jan. 1894 (fl.), *Scott Elliot* 2791 (*typus* : *Marsdenia zambesiaca* Schltr.).

Mozambique. Tette ; Feb. 1859 (fl.), *Kirk* s.n.* Boruma ; Jan. 1891 (fl., fr.), *Menyharth* 802. Boka, Gazaland ; Dec. 1906 (fl.), *Swynnerton* 1917. Baroda, on trees between Zambesi and Nkanya rivers, 900 ft. ; July 1950 (fr.), *Chase* 2222. Raza Is. ; *Forbes* s.n.

Bechuana land. Kwebe Hills, Ngamiland, 3000–3500 ft. ; Aug. 1897 (fr.), Dec. 1897 (fl.), *L ugard* 17 ; Dec. 1896 (fl.), *Lugard* 60. Between Tutumi and Sebena, on granite kopje ; Dec. 1929 (fl.), *Pole-Evans* 2602. Matabeleland, near Ligombwe, Dec. 1895 (fl.), *Penther* 2072 (BM).

Transvaal. Dongola area, Zoutpansberg, in lowveld bush near reservoir, 2000 ft. ; Jan. 1949 (fl.), *Codd* 4828. Messina, in open bushveld, 1900 ft. ; Dec. 1945 (fl.), *Gerstner* 5763.

Dregea rubicunda *K. Schum.* in Engl. Bot. Jahrb. **17,** 147 (1893), et in Engl. Pflanzenw. Ost Afr. **C,** 326, t. 39 A–H (1895), et in Engl. et Prantl, Naturl. Pflanzenfam. **4** (2), 293, f. 90 A (1895), et in Ann. Istit. Bot. Roma, **7,** 43 (1898).

Marsdenia rubicunda (K. Schum.) N. E. Br. in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 421 (1903).

* Dr. (later Sir John) Kirk was evidently allergic to this plant. He remarks :—" The flowers are of a faint yellowish colour and have a most offensive smell unlike anything else I know. If this remains near one for a short time it produces pain in the forehead with all the feelings of cold in the head ".—A.A.B.

Flowering specimens of this species are not easily separable from *D. abyssinica* (Hochst.) K. Schum., but the straight wings of the follicles, contrasted with the often very complicated wings of the latter species, at once distinguish it. Most specimens show a red tomentum on the young parts, absent in *D. abyssinica*. Schumann recorded it from Somaliland, but I have not seen specimens from that region.

Ethiopia. Meschra, on the Gazelle river ; May 1862 (fr.), *Schweinfurth* 1255.

Sudan. Darfur ; *Purdy* 69. On the Yirol–Rumbak road ; " climber, flowers white ; eaten by animals ; vern. name : ACHÀU (Dinka) " ; April 1939 (fl.), *Andrews* 737. Yirol plateau, occasional in thickets ; " climber with woolly greenish white flowers " ; June 1941 (fl.), *Myers* 13840. Um Mikina, Da'ein Darfur, 11° 25′N., 26° 20′E., 480 m. ; " climber, stem woody, with corky ridges,* 15 mm. thick ; leaves mealy-pubescent, fruit of two [horizontally opposed] follicles " ; Nov. 1954 (fr.), *Jackson* 3263.

Kenya Colony. Mombasa Is. ; July 1875 (fl.), *Hildebrandt* 2024 (*lectotypus nominis specei*). Mariakani : " small climber, flowers white and not very pleasantly scented " ; *Graham* 1894. Mwachi, near Mombasa ; " latex present " ; April 1930 (fl.), *Graham* 2335. English Point, Mombasa ; May 1934 (fl.), *Napier* 6201. Garissa, 600 ft., climbing over bushes ; " flowers green, strongly scented " ; Dec. 1942 (fl.), *Bally* 1996. Kilifi : April 1945 (fl.), *Jeffery* K.148. Moyale, Northern Province, 3° 32′N., 39° 03′E., 2700 ft., by stream bed on deep sand at foot of escarpment ; " more or less woody climber, leaves and [young] fruit mealy, fruit four-winged " ; Aug. 1952 (fr.), *Gillett* 13746. Lararok, 4000 ft. ; Sept. 1944 (fr.), *Bally* 3984.

Uganda. River Apule, Karamoja, 4000 ft., locally abundant in riverine forest ; " climber to 20 ft. " ; Oct. 1939 (fr.), *Thomas* 3091. North (30–50 miles) of Kacheliba, Karamoja, in thorn bush on sandy soil ; " flowers yellowish " ; May 1953 (fl.), *Padwa* 100. Lake Albert (S.W.), 2300 ft. ; Nov. 1906 (fl.), *Bagshawe* 1313 (BM). Fasao, Victoria Nile, Unyoro, 2400 ft. ; May, 1907 (fl.), *Bagshawe* 1605 (BM).

Tanganyika Territory. Tanga ; Febr. 1893 (fl.), *Volkens* 154. Bombuera, Usambara ; Febr. 1893 (fl.), *Holst* 2195. Muoa, Usambara ; June 1893 (young fr.), *Holst* 3041. Without locality or date (fr.), *Busse* 279. Pongwe, Tanga District, 500 ft., locally common in stands of *Tamarindus*, *Sideroxylon*, *Canthium zanzibaricum* and *Manilkara sulcata*, or *Pteliopsis–Tetracera–Acacia* open bush, on grey sandy loam ; " a twining shrub with very corky stems and 4-winged fruits ; roots chewed as an aphrodisiac ; vern. name, UBOMBO (Kisham.) " ; Jan. 1937 (fr.), *Greenway* 4835. Kikombo, 3600 ft., on dry rocky hill sides ; July 1950 (fr.), *Bally* 7923. Bushiri, Pangani District, at sea level, in sandy soil ; " strong climber, flowers creamy green with a rank odour " ; Dec. 1950 (fl.), *Faulkner* 735 (with material in spirit). Kwingowa, Mwanza District, 3800 ft., on hillside ; " creeper over small trees and shrubs, sap milky and profuse, stems rough, flowers white, not aromatic " ; May 1953 (fl.), *Tanner* 1399. Sawa, Tanga District, at sea level, in coastal savannah ; " a strong climber, flowers pale creamy green, sweet-scented ; pollinated by small dark brown ants " ; April 1955 (fl.), *Faulkner* 1588.

Dregea floribunda *E. Mey.* Comm. Pl. Afr. Austr. 199 (1837), holotypus nominis generici ; Decne. in DC. Prodr. **8,** 618 (1844) ; Hook. f. in Harv. Gen. S. Afr. Pl. ed. 2, 239 (1868) ; Schltr. in Engl. Bot. Jahrb. **18,** Beibl. 45, 12 et 23 (1894), et *l.c.* **21,** Beibl. 54, 12 (1896), et in Journ. Bot. **36,** 486 (1898), et in Ann. Naturhist. Hofmus. Wien, **18,** 398 (1903) ; Wood et Evans, Natal Pl. **1,** 69, t. 86 (1899), quoad descr. et ic. fruct. tantum.

Pterophora dregea Harvey, Gen. S. Afr. Pl. 223 (1838).

Marsdenia floribunda (E. Mey.) N. E. Br. in Thiselton-Dyer, Fl. Trop. Afr. 4 (1), 422 (1903), in obs., et in Thiselton-Dyer, Fl. Cap. **4** (1), 774 (1908), non Schltr. (1914), nec *Stephanotis floribunda* Brongn. (1837).

M. dregea (Harvey) Schltr. in Engl. Bot. Jahrb. **51,** 143 (1914).

* Not seen in any herbarium specimen ; presumably the collector is referring to the lowest parts.—A.A.B.

The South African distribution of this species in the eastern part of the Cape Province northwards into Natal and Zululand is now fairly well known ; the following is a new record :—

Mozambique. South of Save, Maputo, Goba, about 300 m. ; April 1949 (fr.), *Myre* 654.

Dregea stelostigma (*K. Schum.*) *Bullock*, comb. nov.*

Marsdenia stelostigma K. Schum. in Engl. Bot. Jahrb. **33,** 330 (1903) ; N. E. Br. in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 619 (1904) ; Bullock in Kew Bull. **1954,** 364 (1954).

Stigmatorhynchus stelostigma (K. Schum.) Schltr. in Engl. Bot. Jahrb. **51,** 141 (1913), in obs.

Marsdenia stefaninii Chiov. Res. Sc. Miss. Stefan.–Paoli Somal. Ital. **1,** 116 (1916), et Fl. Somala, 221 (1929).

I have not yet seen specimens of this species from either Ethiopia or Somalia, where its occurrence was recorded by Schumann (1903), and by Chiovenda (1916, 1929). It is represented at Kew by a specimen from Kenya which I recorded in 1954 :—

Kenya Colony. 27 miles from Mtito Andei, Mzima springs, Tsavo Game Park, on a rocky slope near Tsavo river ; " woody climber, flowers cream, fruits winged " ; Jan. 1950 (fl., fr.), *Bally* 7735.

Dregea abyssinica (*Hochst.*) *K. Schum.* in Engl. Pflanzenw. Ost Afr. **C,** 326 (1895), et in Engl. et Prantl, Naturl. Pflanzenfam. **4** (2), 293, f. 90 B (1895).

Pterygocarpus abyssinicus Hochst. in Flora, **26,** 78 (1843) ; Walp. Rep. **6,** 491 (1846–47).

Hoya africana Decne. in DC. Prodr. **8,** 639 (1844), nomen superfluum ; A. Rich. Tent. Fl. Abyss. **2,** 46 (1851) ; Vatke in Linnaea, **40,** 217 (1876).

Dregea africana (Decne.) Martelli, Florul. Bogos. 55 (1886) ; Penzig in Atti Congr. Bot. Internaz. 1892, 349 (1893).

Marsdenia spissa S. Moore in Journ. Bot. **39,** 260 (1901) ; N. E. Br. in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 420 (1903) ; Lanza et Mattei, Pl. Erythr. 59 (1910).

M. abyssinica (Hochst.) Schltr. in Engl. Bot. Jahrb. **51,** 143 (1913) ; Norman in Journ. Bot. **67,** Suppl. 2, 97 (1929) ; Robyns, Fl. Sperm. Parc Nat. Albert, **2,** 107 (1947) ; Brenan, Forest Trees and Shrubs . . . . Tanganyika Terr. Pt. 2, 66 (1949) ; Bullock in Kew Bull. **1952,** 423 (1952), incl. forma *complicata* Bullock, *l.c.*

[*Dregea rubicunda* (non K. Schum.) ;—Hiern in Cat. Afr. Pl. Welw. **1,** 693 (1898).]

Gambia. Kombo ; *Heudelot* (not seen, cited without number by Decaisne in DC. Prodr.).

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* Closely allied to this, but of erect habit, well developed peduncles and exalate follicles, is the following :—

Dregea arabica Decne. in DC. Prodr. **8,** 618 (1844) ;—*Marsdenia robusta* Balf. f. in Trans. Roy. Soc. Edinburgh, **31,** 171, t. 52 (1888).—A.A.B.

Gold Coast. Tumu, Northern Territory, 1000 ft., in fringing forest ; " liane with latex, flowers white " ; April 1935 (fl.), *Vigne* 3794. Without locality or date ; *Anderson* 14. Cape Coast ; *Brass* s.n. (BM).

Nigeria. Tegina, Kontagora, Sokoto ; April 1910 (fl.), *Dalziel* 369. Abbeokuta ; *Barter* 3369. Oke Are Oyo, Ibadan, near the Catholic Cemetery, with *Blighia sapida*, *Mallotus* sp. and *Combretum* sp. ; " climber with latex, flowers whitish, hairy " ; April 1947 (fl.), *Latilo* 21006. Near Kupalo village, about 15 miles from Ibadan on the Ife Road ; " woody twiner to 5 m. high with pale grey-brown twigs ; young stems bright green ; leaves mid-green above, paler below with prominent nerves ; pedicels pale brown-pubescent ; petals greenish cream, corona milky-white " ; April 1950 (fl.), *Meikle and Keay* 1456.

French Cameroons. Weit nach Norden bis in den Bogen des Lom (Sanaga) vor der Vereinigung mit dem Djerem vorgeschobener Ausläufer der geschlossenen Hylaea um Dengdeng etwa 250 Km. NO Jaunde ; March 1914 (fl.), *Mildbraed* 8607. Kongola–Mbussa ; April 1914 (fl.), *Mildbraed* 9110. Kongola, 6°N., 14°E., 750–800 m. ; April 1914 (fl.), *Mildbraed* 9049.

Belgian Congo. Isolé, near Yakoma, 480 m. ; Febr. 1909 (fl.), *Thonner* 219. Without locality or date ; *Smith* s.n.

Sudan. Wau ; May 1869 (fl., fr.), *Schweinfurth* 1696. Fazokl, Sennar ; (fr.), *Kotschy* 566. Abu Zor, Sennar, March 1909 (fr.), *Brown* 1494. Matamma Gallabat ; (fl.), *Schweinfurth* 239.

Ethiopia. Near Sabra ; March 1840 (fr.), *Schimper* 1294 ; July 1838 (fl.), *Schimper* 1366. Medschara ; April 1841 (fl.), *Schimper* 1573 (*lectotypus nominis specei*). Without locality or date ; (fr.), *Quartin-Dillon and Petit* 27.

Eritrea. Ghinda valley, 900–1040 m. ; May 1892 (fr.), *Schweinfurth and Riva* 2186 Keren ; May, 1870 (fl.), *Beccari* 48.

Kenya Colony. Near Lake Marsabit ; 1898 (fl.), *Lord Delamere* s.n. (*typus* : *Marsdenia spissa* S. Moore). Lake Baringo, 3400 ft. ; March 1901 (fl.), *Johnston* s.n. Without locality or date ; *Elliot* 279. Mt. Marsabit, at edge of forest ; " cimber, flowers yellowish green " ; July 1933 (fl., young fr.), *Gardner* 3149. Meru ; Sept. 1943 (fl.), *Bally* 3216. Ngare Narok, Mathew's Range, 5000 ft. ; " climber with white latex " ; April 1944 (fl., young fr.), *Bally* 3657. Quarry at back of Thika Road House, Nairobi, 5500 ft. ; " one dense clump on dusty roadside with *Grewia similis*, *Foeniculum* and *Ipomoea* ; latex milky white ; sepals yellow-green, petals thickish pale green tinged and slightly revolute at the margins which have velvety hairs (the petals have a characteristic texture like velvet) ; coronal lobes like shiny white pinheads, stigma (*sic*) green-tinged ; " Febr. 1951 (fl.), *Veredourt* 438.

Uganda. Elephant grassland, in thicket near Mabira Forest edge, Magoje, 4000 ft. ; March 1916 (fl.), *Dümmer* 2778. Serere, Teso, 3600 ft., among patches of fairly thick vegetation ; " flowers greenish white, delicately and pleasantly scented, with much nectar " ; Jan. 1933 (fl., fr.), *Chandler* 1060. Agoro, in plains ; " climber over bushes and small trees ; fruits yellow-green " ; *Eggeling* 1201 (827) ; " flowers white " ; March 1935 (fl.), *Eggeling* 1605 (1718). Agoro, E. Acholi, 3000 ft., in savannah ; " scandent shrub with white woolly flowers " ; April 1943 (fl.), *Purseglove* 1377. Lututuru, Acholi, 4800 ft., on edge on riverside forest about 100 yds. above upper falls of Lakure river ; " climber to 15 ft., bark on larger stems (which are supple and pliable) corky, yielding copious latex when cut " ; April 1947 (fl.), *Dawkins* 263. Moroto, Karamoja, 4500 ft. ; Oct. 1952 (fr.), *Verdcourt* 784 (with material in spirit).

Tanganyika Territory. Kibwesi, Ukambani, about 1000 m. ; Sept. 1906 (fl.), *Scheffler* 180. Tubugwe, Mpwapwa District, 3700 ft., in riverine fringing forest ; Oct. 1935 (fr.), *Hornby* 699. Kate, Ufipa Plateau ; Oct. 1949 (fl., fr.), *Leonard Silungwe ex Bullock* s.n. Camp 53 miles south of Mbugwe, Malagarasi R. basin, 3800 ft., on termite mounds in *Combretum* woodland ; " climber, to 40 ft. " ; July 1950 (fr.), *Bullock* 3050. Magenga Estate, Karogwe District, 1500 ft., at forest margin ; April 1953 (fl.), *Faulkner* 955, 1210. Nassa, Mwanza District, 3700 ft., Oct. 1952 (fl.), *Tanner* 1079. Banagi Hill, Musoma, Lake Province, 4500 ft., Nov. 1953 (fr.), *Tanner* 1657. Mtibwa Forest Reserve, Morogoro District ; Nov. 1953 (fl.), *Semsei* 1509. Makuyuni District, West Usambara ; March 1936 (fl.), *Koritschoner* 1606. Mbokoyi, East Usambara, in lowland evergreen forest ; March 1941 (fr.), *Greenway* 6149.

Angola. Libongo, in denser forests on the banks of Lifune river near Banza de Libongo ; Sept. 1858 (fl.), *Welwitsch* 4227. Muxâulo, Cazengo, in dense forest ; Dec. 1854 (fl.), *Welwitsch* 4226. Serra da Chella, Bumbo ; Oct. 1859 (fl.), *Welwitsch* 4248. Near the Banza, Huilla ; April 1860 (very young fruit), *Welwitsch* 4249.

Northern Rhodesia. Ndola on an ant-hill (*sic*) in relict chipya woodland ; "woody vine with latex, flowers greenish white, velvety " ; Nov. 1953 (fl.), *Fanshawe* 521 ; *ibid.*, on dambo margin ; June 1954 (fr.), *Fanshawe* 1281.

Southern Rhodesia. Salisbury, 4800 ft. ; Jan. 1921 (fl.), *Eyles* 2915. North side of Meikle's Jungle, Christmas Pass, Umtali Commonage ; " climber to 20 ft., flowers greenish yellow, sweet scented " ; Nov. 1948 (fl.), *Chase* 975. Zimbabwe ruins ; May 1920 (fr.), *Walters* 2798.

Dregea subgen. **Traunia** (*K. Schum.*) *Bullock*, subgen. nov.

Traunia K. Schum. in Notizbl. Bot. Gart. Berlin, **1,** 22 (1895).

Species 3, Africae tropicae et Arabiae incolae.

Key to the species of Dregea subgen. Traunia.

Leafy branches densely pubescent, but without long spreading hairs ; follicles without wings, thinly to densely pubescent, with a shining, wrinkled surface, usually about 7 cm. long but sometimes (*Greenway* 7580) attaining 14 cm. long ; inflorescence freely branched, flowers very numerous ; leaves not cordate at the base *D. schimperi*

Leafy branches clothed with long tawny spreading hairs :

Follicles without wings ; leaves rounded, truncate or acute at the base, rarely shallowly cordate ; corona lobes entire ; apex of the style broadly conical . . . *D. crinita*

Follicles winged ; leaves usually deeply cordate at the base, rarely rounded or truncate; corona lobes bifid ; apex of the style subulate-rostrate . . . *D. faulknerae*

Dregea schimperi (*Decne.*) *Bullock*, comb. nov.

Marsdenia schimperi Decne. in DC. Prodr. **8,** 616 (1844) ; A. Rich. Tent. Fl. Abyss. **2,** 42 (1851) ; Engl. Hochgebirgsfl. Trop. Afr. 343 (1892) ; Martelli, Florul. Bogos. 55 (1886) ; Penzig in Atti Congr. Bot. Internaz. 1892, 349 (1893) ; K. Schum. in Engl. et Prantl, Naturl. Pflanzenfam. **4** (2), 292 (1895) ; N. E. Br. in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 419 (1903) ; Pichi-Sermolli in Miss. Stud. Lago Tana, **7,** Ric. Bot. (1), 116 (1951).

Cynanchum schimperi Hochst. in sched., ex Decne., *l.c.* 617, in syn.

Gymnema ? macrocarpum A. Rich. Tent. Fl. Abyss. **2,** 43 (1851) ; Walp. Ann. **3,** 62 (1852–53).

Traunia albiflora K. Schum. in Notizbl. Bot. Gart. Berlin, **1,** 23 (1895), et in Engl. Pflanzenw. Ost Afr. **C,** 326 (1895), et in Engl. et Prantl, Naturl. Pflanzenfam. **4** (2), 287, f. 85 T–V (1895).

Aden. " Heights of Aden " ; *Hunter* s.n.

British Somaliland. Gurahais, Al Hills, 11° 01′N., 48° 56′E., on rock face in partial shade, 4250 ft. ; " climber hanging down rock for 6 ft. in a heavy mass ; flowers white, strongly scented " ; Nov. 1929 (fl.), *Collenette* 308. Buramo, 10°N., 43° 10′E., 4600 ft., on alluvial clay flats, with *Acacia*, *Acokanthera*, *Euphorbia* and tall grasses ; " climber, flowers white, fruits green " ; Jan. 1933 (fl., fr.), *Gillett* 4843. Goljeit, 10° 05′N., 43° 01′ E., 1650 m. ; Aug. 1933 (fl.), *Godding* 140. Medishe, 5000 ft. ; Oct. 1941 (fl.), *Peck* 239.* Arabseyo, 5200 ft. ; Aug. 1941 (fl.), *Peck* 277.**

Eritrea. Mount Alam Kalé, to the northwest of Aidereso ; April 1892 (fr.), *Schweinfurth and Riva* 1626.

Ethiopia. " In fruticetis prope Genniam regionis Memsach ; June 1837 (fl.), *Schimper* 260 (*typus nominis specei*). Without locality : *Quartin-Dillon and Petit* 20 ;

* Capt. E. F. Peck remarks :—" This plant is grazed by goats and cattle but it causes sickness in them characterized by diarrhoea and in some cases, abdominal pain followed by death. The Somali cure is to kill a sheep and make it into soup which is given slightly warmed in order to induce further diarrhoea ; this is said to be of some benefit ". The Somali vernacular name for the plant is DALLY.—A.A.B.

** Capt. Peck further remarks :—" This is a creeping plant and a tree climber which grows in Hargeisa (vern. name, DUNKAL) and Erigavo (vern. name DALEH) near water, but not in the Haud. The plant is poisonous to stock, which, when affected, are said to stand stiffly and shake ; many die unless soup can be given immediately. If this treatment is adopted, it is said to be a good cure ".

Schimper 1012. Djenda, Dembea ; May 1861 (fl.), *Steudner* 260. To the east of Zefen Tarara (hill to the west of Gogora) in the Lake Tana basin ; March 1937 (young fl.), *Pichi-Sermolli* 1241. Yavello, Sidamo, 6300 ft., in a grove of low trees (*Pleiocarpa pycnantha*) in light soil on the fringe of cultivated land ; " climber, stems with watery juice, fruits with milky latex " ; Jan. 1954 (fr.), *Mooney* 5537.

Sudan. Mount Agnargi, Imatong Mts., 6000–7000 ft. ; June 1939 (sterile), *Andrews* 1952. Gilo, Imatong Mts., 1900 m., in secondary forest, after felling ; " climber with white flowers " ; June 1953 (fl.), *Jackson* 3000 bis.

British Cameroons. Buea to Masaka Camp, 4000–5000 ft. ; " a rambling plant in open forest " ; May 1929 (fl.), *Maitland* 654.

Kenya Colony. Mt. Elgon, 6500 ft. ; " creeper, flowers dirty white, scented " ; April 1931 (fl.), *Lugard* 599. Maji Mazuri, 7400 ft., at forest edge ; " scrambling semi-climber, flowers white, petals twisted " ; May 1932 (fl.), *Graham* 2805. Leroki Plateau ; *Rammell* 3325. Without exact locality, in poor open forest near Forest House; " straggling woody climber, flowers white, sweet-scented " ; July 1933 (fl.), *Gilbert Rogers* 511. Kinangop, 8000 ft., in gorge below the escarpment ; " climber growing in dense masses, twining on itself" ; May 1933 (fl.), *Albrechtsen ex Napier* 5062. North-east Mt. Elgon, 7000 ft., at forest edge ; " climber, flowers cream " ; July 1934 (fl.), *Dale* 3283. Bahati forest, near Bonser's sawmill, 7000 ft., in bushland at fringe of forest ; " greenish white sweet-scented flowers " ; May 1935 (fl.), *Leakey ex Bally* 8575. Naivasha, 6500–6600 ft., in scrub country near a small river ; " twining over neighbouring bushes, 6–8 ft. or more in height, flowers creamy white, fairly strongly and pleasantly scented " ; April 1938 (fl.), *Chandler* 2213. Ngong Escarpment forest, 6000 ft. ; " climber, flowers cream coloured, richly scented " ; Jan. 1939 (fl.), *Bally* 8500. Mt. Elgon, 7600 ft., at forest edge ; " creeper, flowers cream, with twisted petals " ; May 1949 (fl.), *Tweedie* 736. Tinderet forest reserve, Londiani District, 0° 5′S., 35° 27′E., at edge of forest, 2260 m. ; June 1949 (fl.), *Maas Geesteranus* 5007. Mt. Elgon, 7500 ft. ; *Irwin* 19. Muguga, 7300 ft., in *Solanum, Clausena, Dombeya, Hibiscus* scrub paths ; " liane with clusters of faintly scented white flowers with twisted corolla-lobes " ; June 1952 (fl.), *Verdcourt* 668 (with material in spirit).

Tanganyika Territory. Marangu, Kilimanjaro, 1500 m. ; April 1894 (fl.), *Volkens* 2110 (*typus* : *Traunia albiflora* K. Schum.). Mbulu District, common in high forest ; Jan. 1927 (fl.), *Burtt* s.n. Bereka Ridge, at Salanga Hill, Kondoa District, 5000 ft., in secondary *Vernonia* scrub near forest remnants of *Podocarpus*, etc. ; " climber, flowers pale yellow, sweet-scented " ; Jan. 1928 (fl.), *Burtt* 1066. Nangwa, Mt. Hanang, 7580 ft., very common over bushes and trees in *Cassia didymobotrya, Clausena anisata, Hibiscus fuscus, Solanum aculeastrum* secondary bush or in *Celtis kraussiana, Calodendrum capense, Maba abyssinica* evergreen forest in dark greyish-brown loam of volcanic origin, in mountain gorge ; " liane with corymbs of white flowers and paired follicles " ; Feb. 1946 (fl., young fr.), *Greenway* 7580*.

Dregea crinita (*Oliv.*) *Bullock*, comb. nov.

Marsdenia crinita Oliv. in Hook. Ic. Pl. t. 1993 (1891) ; N. E. Br. in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 418 (1903) ; Norman in Journ. Bot. **67,** Suppl. 2, 97 (1929) ; Hutch. et J. M. Dalz. Fl. W. Trop. Afr. **2,** 60 (1931).

Hutchinson and Dalziel (1931), gave only Sierra Leone and Southern Nigeria as the distribution of this species, although Norman (1929) had already indicated its presence in Angola. I have seen further material, including specimens from the Gold Coast and Gabun, as well as a doubtfully labelled specimen alleged to have come from Southern Rhodesia.

Dregea crinita is nearly allied to *D. faulknerae* Bullock, from the eastern coastal region of Tanganyika, described below. The two species evidently fill similar ecological niches and I expect further exploration to extend the known ranges of both of them.

Portuguese Guinea. Between Catió and Cumebú ; June 1945 (fl.), *Santo* 2094.

Sierra Leone. Near Bendembu, Limba ; April 1892 (fl.), *Scott Elliot* 5651. Tiama ; Jan. 1927 (fr.), *Dalziel* 8095. Yumbuma ; " climber, white fragrant flowers " ; April 1940 (fl.), *Deighton* 3944.

* This specimen shows a pair of young but fully grown follicles ; they are much longer and relatively more slender than any others I have seen.—A.A.B.

Gold Coast. Apla, 600 ft., in forest ; " climbing shrub with white flowers " ; Oct. 1935 (fl.), *Vigne* 4044.

Nigeria. Oyo ; " large twiner, flowers white " ; *Barter* 3426 (*holotypus in Herb. Kew.*) ; May 1890 (fl.), *Millson* s.n. Near Ibadan, on hill above waterworks, in dense bush ; " stout woody climber with light brown twigs, not exuding white latex when broken, young growths covered with pale tawny hairs ; leaves deep lustrous green above, light green below with very prominent pale nerves, peduncles and calyx pale green, corolla pure white ; flowers with an unpleasant foetid-sweet odour " ; April 1950 (fl.), *Meikle* 1430 (with material in spirit).

Gabun. Nyanga region ; *Le Testu* 1852.

Angola. Nkanda Mbaka, near rivers Luali-Chiloango, Maiombe, Portuguese Congo ; " soft woody climber, flowers white " ; April 1923 (fl.), *Gossweiler* 9070. Cazengo, Loanda ; *Gossweiler* 4654, 5388 (BM). Mt. Queta, Golungo Alto ; April, 1856 (sterile), *Welwitsch* 6201 (BM).

Southern Rhodesia. Without locality ; May 1924 (fl.), *Craster* 210*.

Dregea faulknerae *Bullock*, sp. nov. *D. crinitae* (Oliv.) Bullock affinis, sed minus pilosa, gynostegio longius rostrato, coronae lobis apice bifidis multo longioribus, floribus paullo minoribus, folliculis alatis differt.

Herba vel *frutex* volubilis, omnibus partibus (corolla excepta) dense pubescentibus. *Caules* hornotini pilis longis patentibus cum pilis brevioribus intermixtis densissime induti ; annotini glabrescentes, demum glabri, lenticellis et cicatricibus foliorum delapsorum prominentibus obtecti, molliter lignosi, internodiis 6–10 cm. longis et demum usque 5 mm. diametro, sed internodiis ramorum lateralium multo brevioribus vix 2 cm. attingentibus. *Folia* longe petiolata, petiolis tenuibus 2·5–4 (6) cm. longis densissime pubescentibus apice glandulis 3 5 conicis praeditis ; lamina latissime ovata vel fere rotundata, 7–10 cm. longa et usque 9 cm. lata, interdum minor, rarius major, basi profunde cordata vel rarius truncata vel rotundata, apice abrupte acute acuminata (interdum vix acuminata et acumine maximo vix 1 cm. longo), subtus dense molliter pubescens, supra parcius pubescens. *Cymae* sympodialiter laterales, pedunculis 2–3-furcatis circiter 2–3 cm. longis densissime pubescentibus, ramis 1–1·5 cm. longis, floribus apice ramorum racemose congestis, pedicellis tenuibus circiter 1·5 cm. longis, bracteis bracteolisque mox deciduis anguste lanceolatis 5–6 mm. longis. *Calyx* fere ad basin 5-lobatus, intus glandulis conicis 5 in sinubus praeditus, lobis anguste lanceolatis circiter 5·5 mm. longis acutis extra pubescentibus. *Corolla* plus minusve alba, demum lutescens ; tubus urceolatus, 4 mm. longus, intus praesertim fauce pubescens, extra glabra ; lobi patentes, leviter torti, oblongi, 8 mm. longi, 2 mm. lati, apice vix acuti vel oblique truncati, interdum emarginati, intus basi tantum leviter pubescentes, ceterum glabri. *Gynostegium* 8 mm. longum, rostro 5 mm. longo coronatum. *Coronae lobi* 3·5 mm. longi, partibus superioribus liberis triangulari-ligulatis erectis apice bifidis 2·5 mm. longis, basi carnosi gynostegio adnati, cum alis antherarum alternantes. *Antherae* appendicibus membranaceis late triangularibus vix 1 mm. longis coronatae. *Ovarium* densissime pubescens. *Folliculi* immaturi glabri, fusiformes, apice obtusi, longitudinaliter quadrialati.

Tanganyika Territory. Magunga Estate, Korogwe district, 1500 ft., among bushes in the shady forest margin ; " climber with rather large cream flowers " ; April 1953 (fl.), *Faulkner* 1189 (*holotypus in herb. Kew.*) ; *ibid*, June 1952 (fl.) and Sept. 1952 (young fr.), *Faulkner* 1019.

* This is very doubtful. The specimen is not accompanied by its original label, and its general appearance suggests that it may be a portion of *Gossweiler* 9070.—A.A.B.

It gives me great pleasure to dedicate this new species to Mrs. Helen Faulkner, who has enriched the Kew collections from Tanganyika and Mozambique with specimens of a great number of rare plants, most beautifully collected, annotated and preserved, and has shown an unfailing willingness to obtain additional material of special *desiderata*.

Dregea faulknerae differs from *D. crinita* Oliv., a plant of western Africa, in its shorter, less dense, less tawny indumentum, and smaller flowers with relatively shorter calyx ; the beak of the gynostegium is longer and more acute and the coronal lobes are longer, less fleshy in the free portion and distinctly bifid at the apex. It is at once distinguished from *Dregea schimperi* by its cordate leaves and alate follicles, though the wings are much less well developed than in some species of subgen. *Dregea*. The inflorescences of *D. faulknerae* are somewhat smaller than those of *D. crinita*, with much smaller bracts (never with a distinctly leafy lamina) ; the long slender pedicels, racemosely arranged at the tips of the cyme-branches give both species, however, similar facies.

Stenostelma *Schltr.*

I have already (Kew Bull. **1952,** 417 : 1952) resuscitated Schlechter's generic name *Stenostelma* for the genus named *Krebsia* Harv. (non Ecklon et Zeyher) in the *Flora Capensis*. In that work (1907), N. E. Brown characterised the genus by reference to the corona of a single species (*S. stenoglossa* Schltr.), but this is far too exclusive, particularly in the minute detail given by Brown. The coronal lobes, from the generic standpoint, are fleshy, more or less elongated and channelled on the inner face but without appendages, overtopping the gynostegium and more or less incurved over it. In *S. gibba* (E. Mey.) Bullock (*l.c.*) and *S. eminens* (Harv.) Bullock (*l.c.* **1953,** 342 : 1953) the corona is very prominent indeed, the lobes being expanded laterally towards the base and produced at the apex into an acuminate or subulate point. In *S. stenoglossa* these features are less marked and in the following species the basal expansion and pointed apex are lacking :—

Stenostelma carinatum (*Schltr.*) *Bullock*, comb. nov.

Krebsia carinata Schltr. in Journ. Bot. **33,** 269 (1895), et in Ann. Naturhist. Hofm. Wien. **15,** 67 (1900).

Gomphocarpus carinatus (Schltr.) Schltr. in Journ. Bot. **42,** 258 (1904).

Xysmalobium carinatum (Schltr.) N. E. Br. in Thiselton-Dyer, Fl. Cap. **4** (1), 568 (1907), et *l.c.* 1130 (1909).

Brown (*l.c.*) remarked that this plant is closely similar to *Krebsia stenoglossa* (*Stenostelma capense*) and in this he was certainly correct, but his similar remark concerning its likeness to " *Schizoglossum periglossoides* " is not so accurate, for the coronal structure is entirely different.

Parapodium *E. Mey.*

The corona of *Parapodium* arises so low on the staminal column as to appear to arise from the corolla and it is on this character that it is separated from its allies by both Brown (1907) in the *Flora Capensis* and by

Phillips (1951) in his *Genera of South African Flowering Plants*. This is, however, a wrong interpretation of the floral structure, and has led to the inclusion in *Parapodium* of plants which rightly belong elsewhere.

Apart from the very characteristic leaves, the corolla of *Parapodium costatum* E. Mey. is in the form of a broad shallow bell ; there is a quite definite subglobose corolla-tube and the acute corolla-lobes are recurved at their tips ; the corona arises in the angle between the corolla and the staminal column, and is adnate to the corolla almost up to the sinuses between its lobes. Brown described only the free portion of the corona.

Brown also draws attention to the similarity between " *Parapodium crispum* " and " *Woodia mucronata* " ; these two species are so much alike, and also so similar to " *Xysmalobium gomphocarpoides* " that *Parapodium crispum* may be " . . . . readily mistaken for either of them. To these three species I would add " *Xysmalobium brownianum* S. Moore ". The floral differences between them are small, the most noticeable being the degree of adnation of the corona to the corolla, which in turn depends on the length of the corolla-tube. These are greatest in *Parapodium crispum* and least in the two (?) species of *Xysmalobium*.

Although these four species are so similar as to be easily mistaken one for another, all of them are quite distinct from *Parapodium costatum* E. Mey. and from *Woodia verruculosa* Schltr., the types of the respective generic names. I propose, therefore, to limit the genus *Parapodium* to a single species, *P. costatum* E. Mey., since *P. simile* N. E. Br. is scarcely distinct, whilst the other species are referable to other genera.

The Study of Plant Communities.*—The first edition of this book was reviewed in the Kew Bulletin 1948, p. 171. The second edition has been brought up to date by making considerable detailed modifications and revisions and by additions. The number of references has been very much increased. As with the original edition there is much to recommend this text-book as an introduction to a rapidly expanding subject. It is extremely compact yet covers most of the basic principles of plant ecology adequately. The work is written from the American standpoint and most of the illustrative examples are chosen from the vegetation of the U.S.A. While it is true that general principles hold for all parts of the world and also that it is well for British students to learn as much as possible of the flora and vegetation of other countries, it is widely held that an introduction to the study of the plant life of one's homeland is a first essential. It can thus not be suggested that this " introduction to plant ecology " should replace British textbooks in this country. As a work of reference to student and teacher it should be very useful.

W. B. Turrill.

* The Study of Plant Communities by Henry J. Oosting, W. H. Freeman & Co. San Francisco, ed. 2, 1956, pp. 440, $6.00 (51/-), British agents, Bailey Bros. & Swinfen Ltd., London.

MICROLEPIA SPELUNCAE (L.) MOORE, M. TRAPEZIFORMIS (ROXB.) KUHN AND M. FIRMA METT. IN KUHN

W. A. Sledge

Microlepia speluncae (L.) Moore is based on a specimen collected by Paul Hermann in Ceylon in 1672–77 which was described by Linnaeus in *Flora Zeylanica* 182, no. 384, 1748 and named *Polypodium speluncae* in the *Species Plantarum* **2,** 1093, 1753. Its accredited distribution embraces most of the Old World Tropics and Polynesia. Throughout its range it exhibits great variation and many names have been given to forms and allies of uncertain taxonomic value. A satisfactory understanding of this species complex can never be achieved by studies of herbarium specimens alone, for the large size of the plants which are nearly always represented in collections by portions only of the fronds, precludes any appreciation of habit differences. Studies of the living plant in cultivation combined with ecological studies of wild populations and cytological observations are required before a firm understanding and stable arrangement of the taxa concerned becomes possible.

The most important contributions to the taxonomy of *Microlepia* as represented in the Indian region are those of C. B. Clarke (A Review of the Ferns of Northern India, *Trans. Linn. Soc. Bot.* **1,** 425–619, 1880), K. Prantl (*Arb. Bot. Gart. Breslau,* **1,** 25-38, 1892), and C. C. Lacaita (*Journ. Linn. Soc.* **43,** 486, 1916). Christensen's treatment and synonymy in the *Index Filicum* and its *Supplements* owes much to these works.

Clarke recognised only *M. strigosa* and *M. speluncae* (under the names *Davallia polypodioides* Don and *D. flaccida* R. Br. respectively), grouping the numerous related forms or species as varieties under them. He separated *M. strigosa* and its allies from *M. speluncae* sens. lat. by a combination of two characters, the former having prominent raised veins on the undersurface of the pinnule segments and the pinna rachis being strigosely hirsute beneath i.e. the hairs close together, somewhat stiff and slanting forwards. In *M. speluncae* the veins are not raised, and the pinna rachis is never strigose-hirsute, the hairs being softer and spreading.

Prantl employed indusial and soral characters whereby to separate these two groups. Lacaita considered soral position to be a character of value in distinguishing between the species. But the characters used by Prantl and Lacaita do not appear to me to be at all definite or clear cut. Clarke's emphasis however on the strigose pubescence of the pinna rachis in the *M. strigosa–trapeziformis–firma* group, is certainly a character of first-rate importance as it affords an easy and reliable means whereby all herbarium specimens examined can be separated readily from *M. speluncae* and its many forms.

Lacaita rightly refers to Clarke's superior knowledge and treatment of the North Indian forms as compared with other botanists though he does not appear himself to have consulted Prantl's work or Wallich's specimens. His criticism moreover of Clarke's work as being "unfortunately confused by his having overlooked the fact that some of the specimens distributed by Wallich do not agree even in genus with the corresponding numbers in his own herbarium " is unjust when in fact it was Clarke who

first gave a complete list of the Wallich Herb. numbers and pointed out the discrepancies between some of the numbers in the Wallich and Hooker herbaria. Indeed Lacaita was himself responsible for perpetuating an error in Clarke's synonymy by copying from him, and by so doing he has confused rather than clarified the matter of correct application of names.

The works of Clarke, Prantl and Lacaita all quote Wallich's manuscript names for *Microlepia* fronds in his collection, and Wallich's specimens, where validated by later descriptions, are basic to correct nomenclatural treatment. A re-examination of all the Wallich specimens both in the Wallich herbarium and in Hooker's herbarium incorporated in the general collection at Kew, has revealed certain errors in the works referred to above and the object of this paper is to correct these and to suggest a provisional rearrangement of the species and varieties pending more detailed information based on living plants. The most important correction concerns *M. pilosula* which, as Wallich's specimens and Prantl's description show, is a pilose form of *M. speluncae* but which Lacaita, amplifying an error of Clarke's, construed as a different species, his *M. pilosula* being identical with and antedated by *M. firma* Mett. in Kuhn.

Citations of specimens of *M. trapeziformis* and *M. firma* are given below, but it appears superfluous to list the very large number of sheets of *M. speluncae* represented in the National Herbaria. The three varieties into which it is here subdivided are somewhat arbitrary divisions in a series showing every gradation from nearly glabrous to densely pilose, and hence many specimens fall between the three norms. The species may be distinguished as follows :—

Pinna rachis pilose or laxly hairy with soft spreading hairs or almost glabrous, pinnule veins immersed beneath . . . . *M. speluncae*

Pinna rachis strigose-hairy, the hairs stiff and slanting forwards, pinnule veins evident to strongly raised beneath

Fronds tripinnate, pinnules obtuse, entire or subentire, veins evident or raised beneath . . . . . *M. trapeziformis*

Fronds quadripinnatifid, pinnules acute, sharply incised, veins strongly raised beneath . . . . . *M. firma*

Microlepia speluncae (*L.*) *Moore*, Ind. Fil. XCIII, 1857.

Polypodium speluncae L., Sp. Pl. **2,** 1093, 1753.

Dicksonia polypodioides Sw., Schrad. Journ. **1800**[2], 91, 1801 ; Syn. Fil., 137, 356, 1806.

Davallia flaccida R. Br., Prod. Fl. N. Holl. 157, 1810 : Don, Prod. Fl. Nepal. 10, 1825.

Microlepia polypodioides Presl, Tent. Pterid. 125, 1836.

Davallia polypodioides Hook., var. α *subglabra* and var. β *pubescens* Hook., Sp. Fil. **1,** 182, 1846 ex maxima parte, non *D. polypodioides* Don.

Davallia speluncae Hook. & Bak., Syn. Fil. 2 ed. 100, 1874 pro parte.

Microlepia speluncae var. *hirta* Bedd., Handb. Ferns Brit. Ind. 68, 1883.

α var. **speluncae**

Polypodium speluncae L., Sp. Pl. **2,** 1093, 1753.

Aspidium pilosulum Wall. 337 in Herb. Hook. (nom. nud.).

Davallia polypodioides var. α *subglabra* Hook., loc. cit., partim.

Davallia flaccida var. *pilosula* Clarke, Trans. Linn. Soc. Bot. **1,** 449, 1880.

Microlepia puberula forma *pilosior* Lacaita, Journ. Linn. Soc. **43,** 486, 1916.

Rachis of pinnae laxly hairy beneath ; undersurface of segments hairy, hairs all or mostly restricted to veins.

β var. **pubera** (*C. B. Clarke*) *Sledge*, comb. nov.

Davallia virens Wall. 264 (nom. nud.).

Davallia pilosula Wall. 263, 3rd sheet only (nom. nud.).

Aspidium puberum Wall. 338 in herb. Hook. (nom. nud.).

Davallia polypodioides var. α *subglabra* Hook., loc. cit., partim.

Davallia flaccida var. *pubera* Clarke, loc. cit. 449, 1880.

? *Microlepia puberula* Lacaita, loc. cit., 485, 1916, non *D. puberula* Wall. 262 nec *M. puberula* van Alderw. van Rosenb., Bull. Jard. bot. Buit. 11, nr. XI, 17, 1913.

Rachis of pinnae slightly hairy or nearly glabrous beneath ; undersurface of segments glabrous or nearly so.

γ var. **pubescens** (*Hook.*) *Sledge*, comb. nov.

Davallia villosa Don, Prod. Fl. Nepal. 10, 1825.

? *Davallia pilosa* Roxb., Calc. Journ., **4,** 515, t. 32, 1844.

Davallia pyramidata Wall. 261 (nom. nud.) Villous.

Davallia puberula Wall. 262 (nom. nud.) Pilose.

Davallia pilosula Wall. 263 1st and 2nd sheet and in herb. Hook. (nom. nud.) Pilose.

Davallia polypodioides var. β *pubescens* and (in part) var. γ *hispida* Hook., Sp. Fil. **1,** 182, 1846.

Davallia flaccida var. *pyramidata* Clarke, loc. cit., 449, 1880.

Microlepia pilosula Prantl, Arb. Bot. Gart. Breslau, **1,** 36, 1892 ; ? Tard.-Bl. & C. Chr., Fl. Ind. Chine, 97, 1939.

Microlepia pyramidata Lacaita, loc. cit., 486, 1916.

Microlepia speluncae incl. var. *pyramidata* Tard.-Bl. & C. Chr., Fl. Ind. Chine, 99–100, 1939.

Microlepia speluncae var. *villosissima* C. Chr., Gard. Bull. Str. Settl., **4,** 399, 1929.

Dennstaedtia villosa Cop., Elmer's Leaflets **3,** 824, 1910.

Rachis of pinnae very hairy ; undersurface of segments pilose to villous, hairs not confined to veins.

Microlepia trapeziformis (*Roxb.*) *Kuhn*, Chaetopt. 347, 1882.

Davallia trapeziformis Roxb., Calc. Journ. **4,** 516, 1844.

Davallia rhomboidea Wall. 257 (nom. nud.) ; Kunze, Bot. Zeit., **8,** 158, 1850.

Microlepia rhomboidea Presl, Tent. Pterid., 125, 1836 (nom. nud.).

Davallia polypodioides var. δ *rhomboidea* and (in part) var. γ *hispida* Hook., Sp. Fil. **1,** 182, 1846.

Davallia polypodioides var. *rhomboidea* Clarke, Trans. Linn. Soc. Bot. **1,** 448, 1880.

Davallia strigosa var. *rhomboidea* Hook. & Bak., Syn. Fil. 2 ed. 99, 1874 pro parte.

Microlepia polypodioides Bedd., Ferns South. Ind., t. 15, 1863.

Microlepia speluncae Type. Bedd., Handb. Ferns Brit. Ind. 68, 1883.

Microlepia rhomboidea Prantl, Arb. Bot. Gart. Breslau **1,** 31, 1892.

Microlepia rhomboidea var. *trapeziformis* Prantl, loc. cit.

China : *Henry* 10093D, 11555, 12898, Yunnan (Det. *M. pilosula* by *Christensen* and *M. obtusipinnula—nom. ined.*—by *R. C. Ching*) (K) ; *Hancock* 180, mountains near Atipo, across the Red River (K).

Indo-China : *Petelot* 3638, Tonkin, Chapa vers 1900 m., 1929 (BM).

Siam : *A. F. G. Kerr* 10376, Kao Ri Yai, Kanburi *ca.* 1400 m. 1/2/1926 (K).

Malay : *R. E. Holttum* 23509, 31293, Pahang, Cameron Highlands *ca.* 5000 ft. (K).

Sumatra : *C. G. Matthew*, G. Korinchi, 6000 ft., 12/1/1914 (K) ; G. Tandikat, in dense forest, 6000 ft. 13/1/1913 (K)—the former determined by *Christensen* as *M. pilosula* and both as *M. obtusipinnula—nom. ined.*—by *R. C. Ching.*

Java : *Horsfield* (BM).

India : Kumaun. *R. W. Macleod* ex herb. *C. W. Hope*, Sargio Ganga Valley, 5000 ft., Aug.–Sept. 1893 (BM). Nepal. *Wallich* 257 and three other Wallich sheets (BM). Sikkim. *Gamble* 5069 (K). Assam. Khasi hills, *Griffith* (BM) ; *C. J. Simons* (BM) : *Hook. fil. & Thomson*, 4500 ft. (K) ; *Riddell* 31 (K) : *C. B. Clarke* 17876, Javain, Jaintea, Nov. 1892 (BM) : *C. B. Clarke* 18233, Khasia, Nov. 1872 (BM) ; *Gamble* 7816, Chittagong, March 1880 (K). South India. *Beddome*, Nilgiris, type of tab. XVI F.S.I. (K) ; *Gough* 3272, Ootacamund (K) ; *Bourne* 4842, Pulney Hills, Gundau Shola 28/6/1898 (K).

Ceylon : *C.P.* 1388 (K., BM., Herb. Cantab.) ; *Mrs. Walker* as *D. polypodioides* γ *hispida* Hk. det. Hook. (K) ; *Gardner* 1120 (BM., Herb. Cantab.) ; *Mrs. Chevalier*, Kandy (BM) ; *Sledge* 764, Ramboda Pass, Cent. Prov., 5800 ft., 28/12/50 ; *Sledge* 1230, forests on north side of Brae Gap above Hoolankande, Cent. Prov., 3500 ft., 4/3/54 ; *Sledge* 1274, jungle above Beverley Estate, Deniyaya, Southern Prov., 3000 ft., 12/3/54 ; *Sledge* 1308, forest above Ramboda Pass, Cent. Prov., 6300 ft., 17/3/54.

Microlepia firma *Mett. in Kuhn* in Linnaea **36,** 146, 1869.

Davallia polypodioides Don, Prod. Fl. Nepal. 10, 1825, non *Dicksonia polypodioides* Sw.

Davallia Roxburghii Wall. 2218 (nom. nud.).

Davallia hirta var. β Hook., Sp. Fil. **1,** 181, 1846 : Hook. & Bak., Syn. Fil. 2 ed., 100, 1874 as to Indian and Ceylon plants.

Davallia polypodioides var. *pilosula* C. B. Clarke, Trans. Linn. Soc. Bot. **1,** 448, 1880, non *D. pilosula* Wall. 263.

Microlepia pilosula Lacaita, Journ. Linn. Soc. **43,** 485, 1916, non Wall. nec Prantl.

Microlepia hirta Prantl, Arb. Bot. Gart. Breslau **1,** 30, 1892 as to Indian and Ceylon plants.

Microlepia hirta C. Chr., Ind. Fil. 426, 1906 quoad pl. asiat., non Ind. Fil. Suppl. **3,** 127, 1934.

India : Nepal. *Wallich* spec. ex herb. J. Smith det. *D. polypodioides* by D. Don (BM) : *Wallich* 1819 (BM) ; *Wallich* 1820 (K) ; *Lambert* 1834 (BM) ; *Stainton, Sykes* and *Williams* 2459, nr. Pokhara, 3500 ft., 14/4/54 (BM) ; *Stainton, Sykes* and *Williams* 5080, above Bakhri Kharka, 7000 ft., 26/4/54 (BM).

Sikkim. *Treutler* 777, Rungnoo Valley, 5000 ft., 16/9/1874 (K) ; *Gamble* 8086 Lebrug, Darjeeling 5500 ft., May 1880 (K) ; *Atkinson* 8308 ex herb. *C. B. Clarke* (K) ; Darjeeling, July 1910 ex herb. Mus. Paris., det. *Rosenstock* as *M. pilosula* (K) ; *Lacaita*, near Rhikisum, ± 6500 ft., 24/4/1913 as " *Davallia pilosula* Wall. Cat. 263 " (BM).

Bhotan. *Griffith* 2793 (K) ; *Ludlow, Sherriff* and *Hicks*, 18515 (BM).

Assam. *C. J. Simons*, Khasi hills (BM) ; *C. B. Clarke* 14765, Sohra Rum, 5000 ft., 28/11/1871 (K) ; *Kingdon Ward* 19375 near Rima Zayul, 4500 ft., 5/5/1950—a broad leaved form (BM).

Ceylon : *C.P.* 3272 (K., BM., Herb. Cantab.) ; *Mrs. Genl. Walker* (K) ; *G. Wall* spec. ex herb. Mus. Paris. (K).

α var. **firma**

Davallia polypodioides var. *pilosula* C. B. Clarke loc. cit., 448, non *D. pilosula* Wall. 263.

Pinnule segments and veins hairy below.

Griffith 2793, Bhotan (K).

β var. **hirta** (*C. B. Clarke*) *Sledge*, comb. nov.

Davallia polypodioides var. *hirta* C. B. Clarke loc. cit. 448.

Differs in its more densely hairy or tomentose undersurfaces.

Gamble 8086 (K) ; *Atkinson* 8308 (K) ; *Clarke* 14765 (K).

γ **subglabra** *Sledge*, var. nov.

Costae venulaeque infra pilis sparsis obtectae, aliter pinnulae tota vel fere glabrae.

Ceylon : *Thwaites* C.P. 3272.

Microlepia speluncae (*L.*) *Moore*

M. speluncae varies greatly in degree of division of the frond and in hairyness. Wallich gave manuscript names to a series of forms which so intergrade with one another as to defy specific separation ; nor are his specimens uniform where more than one sheet is included under one name. The six variants of his which are all referable to *M. speluncae* sens. lat. are : *Davallia pyramidata* Wall. 261—fronds villous : *D. puberula* Wall. 262—fronds pilose : *D. pilosula* Wall. 263, 1st and 2nd sheet, and in Herb. Hook.—fronds pilose, 3rd sheet in Herb. Wall. is subglabrous : *D. virens* Wall. 264—fronds subglabrous : *Aspidium pilosulum* Wall. 337 in Herb. Hook. only—fronds sparcely hairy : *A. puberum* Wall. 338 in Herb. Hook. only—fronds subglabrous, 338/2nd sheet in Herb. Hook, fronds more hairy.

Clarke arranged these forms as three varieties based on degree of pubescence, his arrangement being :—

var. *pubera* based on *A. puberum* Wall. 338—subglabrous.

var. *pilosula* based on *A. pilosulum* Wall. 337—hairy.

var. *pyramidata* based on *D. pyramidata* Wall. 261—villous.

Clarke also referred *D. puberula* Wall. 262 to this species. His unaccountable transference of *D. pilosula* Wall. 263 to *M. strigosa* (his *D. polypodioides* Don) is discussed below. The type specimen of *Polypodium speluncae* L. based on Hermann's specimen in Herb. Mus. Brit. agrees with Clarke's *D. flaccida* var. *pilosula*.

M. pyramidata was subsequently accorded specific rank by Lacaita but later again reduced by Christensen and Tardieu-Blot (*Fl. Ind. Chine* 100, 1939) to a variety of *M. speluncae*. As there described this variety is distinguished by pinnule shape and texture rather than indumentum, but as *M. speluncae* is described by them as having villous frond segments it would seem to be based on the form here treated as the pilose variant of the typical form. Specimens of *M. speluncae* var. *villosissima* C. Chr. in Herb. Mus. Brit.—two of them so determined by Christensen—are not appreciably different from var. *pyramidata*. As Hooker had already described this pilose variant as var. *pubescens* and quoted *D. pyramidata* Wall. 261 (a sheet of which is annotated by him as β *pubescens* Hook.) in synonymy, the correct name for it is var. *pubescens* (Hook.) comb. nov.

None of the forms or allies of *M. speluncae* have been more misunderstood than *M. pilosula* (Wall.) Presl ex Prantl. Prantl (*loc. cit.* 36) cited in synonymy *Davallia pilosula* Wall. 263 which he had not seen, *M. pilosula* Presl Tent. 125 which is a *nomen nudum*, and *D. polypodioides* γ *hispida* Hook., Sp. Fil. **1,** 182, which is certainly a mixture, the Nepal specimen of Wallich's being *M. speluncae* var. *pubescens* and the Ceylon specimen of Mrs. Walker being *M. trapeziformis*. Prantl had not seen Clarke's treatment of the genus—the evidence for this is given elsewhere in his paper and his practice of including within square brackets all references to literature and specimens not personally seen by him is one which might well be followed by other authors—and his *M. pilosula*, which I take to be *M. speluncae* var. *pubescens*, is certainly not the same as Clarke's *D. polypodioides* var. *pilosula*.

Clarke's account contains an error in respect of *M. pilosula* which was copied by Lacaita and which is responsible for much of the confusion surrounding the application of this name. Clarke's error concerns his *D. polypodioides* var. *pilosula* ostensibly based on *D. pilosula* Wall. 263. This is also *Microlepia pilosula* of Lacaita for he cites Clarke's variety and Wall. 263 in synonymy and both his specimen in Herb. Mus. Brit. and his description of it as having strigose pubescence and prominent veins confirm its position as a member of the *M. strigosa trapeziformis firma* group. Yet none of Wallich's three sheets of *D. pilosula* in his own herbarium or in that of Hooker are strigose hirsute. All are membranous in texture without raised veins and with pilose undersurfaces to the pinnule segments. Moreover Clarke contradicted himself in his treatment of *D. pilosula* Wall. 263, for whereas it is wrongly referred to *D. polypodioides* i.e. *M. strigosa* sens. lat. in the text of his work, it is correctly referred to *D. flaccida* var. i.e. *M. speluncae* sens. lat. in the list of Wallich's numbered sheets with their proper identifications inserted at the end of his paper

(*loc. cit.* 600). Nor can I find a single sheet amongst the very numerous Indian sheets annotated by Clarke according to the arrangement in his paper, which bears his identification as *D. polypodioides* var. *pilosula.* Moore (*Ind. Fil.* 298, 1861) also correctly referred *D. pilosula* Wall. to *M. speluncae.* As described by Tardieu-Blot and Christensen (*Fl. Ind. Chine* 97, 1939) *M. pilosula* seems hardly distinguishable save by size from *M. speluncae*, for the distinguishing character of bipinnate fronds utilised in the key is contradicted—and not only for this species—in the text.

Lacaita's error in copying and amplifying Clarke's mistake is responsible for the misnaming of all the Mus. Brit. and Kew sheets, none of which represents either Wallich's *D. pilosula* or Prantl's *M. pilosula.* In Herb. Mus. Brit. the sheets so named are the same as *M. firma* Mett.: Kuhn. Those so named at Kew are, to me, mostly indistinguishable from *M. trapeziformis.* As a distinct species I do not consider that it is possible on present knowledge based on herbarium specimens, to maintain *M. pilosula.* The Wallich specimens on which it is based differ from *D. pyramidata* Wall. 261 only in the pilose rather than villous undersurfaces of the frond segments, and I take both Prantl's description of *M. pilosula* and that of *Fl. Indo Chine* 97 to refer to one of the pilose or villous forms of *M. speluncae* which I include under *M. speluncae* var. *pubescens.*

Microlepia trapeziformis (*Roxb.*) *Kuhn*

I have not seen the type of *Davallia trapeziformis* Roxb. but it has been accepted by Christensen (*Ind. Fil.* 428, 1906) and Holttum (*Malayan Ferns* 313, 1954) as identical with Wallich's *Davallia rhomboidea.* Wallich's plant is certainly a well-marked species easily separated from *M. speluncae* by the strigose pubescence of the pinna rachis and rounded entire segments of the pinnules. Holttum credits it with a distribution extending from the Eastern Himalayas to Southern China and thence southwards to Malaya. He suggests that Beddome interpreted *D. rhomboidea* too broadly, but specimens agreeing with Wallich 257 from Nepal undoubtedly occur also in South India and Ceylon. Indeed Beddome (*Handb. Ferns Brit. Ind. Ceylon and Malay Penin.*, 68, 1883) who treats this as the type of *M. speluncae*, comments upon its common occurrence in South India and Ceylon and upon its distinctness from the much more variable and true *M. speluncae* which he calls " var. *hirta* ". His illustration (*Ferns South. Ind.* t. 15, 1863) is poor, especially as to the inadequate representation of the characteristic strigose pubescence of the pinna rachis, but the Nilgiri specimen from which the drawing was made is preserved at Kew and was correctly referred to Wallich's *D. rhomboidea* in his later work.

In Ceylon *M. trapeziformis* is a montane species found in forests from 3000–6500 ft. *M. speluncae* grows from sea level up to 3000–4000 ft.

Microlepia firma *Mett. in Kuhn*

Kuhn described this species as having " folia chartacea . . . . . infra in costis nervisque sparce strigosa in rhachibus dense ac breviter hirta . . . . . subquadripinnatisecta . . . . . nervi prominuli "citing specimens collected by Griffith in Bhotan and Mishmee. There is a small portion of frond in Christensen's collection in Herb. Mus. Brit. labelled " Mishmee,

Griffith " and two sheets from Bhotan collected by Griffith, in Herb. Kew all of which show raised veins on the undersurface of the pinnules and strigose pubescence on the pinnule rachis. The specimens agree well with numerous sheets of a large fern with 3–4 pinnatisect fronds in the *M. firma* and *M. pilosula* covers at Brit. Mus., many of which both here and at Kew have been labelled *Davallia* (or *Microlepia*) *hirta* by their collectors. They certainly represent the *Davallia hirta* Kaulf. of Hooker (*Sp. Fil.* **1,** 181, 1846) and of Hooker and Baker (*Syn. Fil.* 2 ed. 100, 1874) and *Microlepia hirta* Prantl (*Arb. Bot. Gart. Breslau*, 30, 1892) in so far as the Indian and Ceylon references are concerned ; and the plant is well characterised in the *Synopsis Filicum* as having " the stature and habit of *D. speluncae* combined with the coriaceous texture and prominent venation of *D. strigosa*." Clarke's name for this species was *Davallia polypodioides* var. *pilosula*, his *D. polypodioides* var. *hirta* being a more hairy variety of the same fern. Lacaita, who copied Clarke, called it *Microlepia pilosula*. The erroneous use of this name has been discussed above under *M. speluncae*. Prantl omits *M. firma* from his treatment of *Microlepia* other than to list it in his concluding remarks as one of the species unknown to him.

Davallia hirta Kaulf. (*Enum.* 223, 1824) was described from specimens of Chamisso's gathered in Oahu and it has been shown by Alston (*Phil. Journ. Sci.* **50,** 177, 1933) that the name is antedated by the earlier described Hawaiian *Davallia setosa* Smith (*Rees Cycl.* **10,** No. 18, 1808). Some plants from the Hawaiian Islands are so close to the Himalayan plant that their union by Hooker and Baker seems reasonable enough, but as I have not seen original gatherings quoted by Kaulfuss or Smith, and considerable variation appears to exist in Hawaiian gatherings, their relationships will not be pursued here, other than to point out that the Indian plant certainly appears even more closely related to the Hawaiian one than to other species in its own region.

Don (*Prod. Fl. Nepal.* 10, 1825) described seven Davallias from Nepal, all based on gatherings by Wallich. Of these *D. villosa* Don and *D. polypodioides* Don have been variously interpreted, for Don's descriptions are inadequate to enable certain recognition. Hooker (*Sp. Fil.* **1,** 181, 1846) equates *D. villosa* Don with *D. hirta* Kaulf. on the authority of Sprengel, and Don's name is so treated by Moore (*Ind. Fil.* 303, 1861), Prantl (*Arb. Bot. Gart. Bres.* 30, 1892) and Christensen (*Ind. Fil.* 215, 1906). *D. polypodioides* Don is attributed by Moore (*loc. cit.* 298) to *M. speluncae*. Christensen (*loc. cit.* 213) identifies it with *M. strigosa*, but he was surely incorrect in so doing as Don described his species in the tripinnate group of *Davallia* species. There is moreover in Herb. Mus. Brit. a specimen of Wallich's from Nepal ex herb. John Smith which is identical with *M. firma* and which has a label pasted over the bottom part of the rachis bearing the identification " *Davallia polypodioides* D. Don ", with an annotation beside it reading " This is written by Don therefore a typical specimen of his *D. polypodioides*. J. Sm." On the evidence of this specimen together with Don's description of his species as having "scabrid tomentose" rachises, *D. polypodioides* Don is clearly identical with *M. firma* Mett. : Kuhn. The latter stands as the valid name as Presl used the combination *Microlepia polypodioides* basing it on Swartz's *Dicksonia*

polypodioides (= *Polypodium speluncae* L.) from the Pacific which Don erroneously cited as a synonym of his Nepal species.

I infer *D. villosa* Don, described as having villose fronds, to be the villose variety of *M. speluncae* called *D. pyramidata* by Wallich and *D. flaccida* var. *pyramidata* by Clarke, on which *Microlepia pyramidata* was based as a full species by Lacaita and listed by Christensen (*Ind. Fil. Suppl.* 3, 128, 1934) but later was reduced by Tardieu-Blot and Christensen (*Fl. Ind. Chine.* 100, 1939) to a variety of *M. speluncae*. In Christensen *Ind. Fil. Suppl.* **3,** 128, 1934, *D. villosa* Don is equated correctly with *M. pyramidata* (Wall.) Lac., though for the wrong reason that *M. hirta* auct. quoad pl. asiat. with which *D. villosa* had previously been united, is also so treated when in fact it (*M. hirta*) is a synonym of *M. firma* Mett. : Kuhn.

Microlepia firma is related to *M. trapeziformis* but differs from that species in the firmer texture of its fronds which are more dissected with toothed segments and with more strongly raised veins on the under surfaces. The fronds are normally tripinnate subquadripinnatifid, the secondary pinnae being acute, whereas in the tripinnate fronds of *M. trapeziformis* the secondary pinnae are for the most part obtuse, the segments being quite or very nearly entire, with blunt and rounded apices. The tertiary pinnae in *M. firma* vary in breadth, sometimes they are narrow and sharply incised, sometimes, especially on the lower pinnae, much broader and shallowly lobed or incised.

Microlepia firma is distributed through the Eastern Himalayas from Nepal through Sikkim and Bhutan to the Khasi hills and also in the mountains of Ceylon. It has not been found in the mountains of Southern India. The North Indian plants vary considerably in hairyness of the fronds, Clarke's *D. polypodioides* var. *hirta* being the most hairy and Wallich's *D. Roxburghii* the least hairy form. Ceylon plants are much less hairy than most N. Indian gatherings the frond segments being glabrous beneath except for scattered hairs on the veins, but in other respects they are hardly distinguishable. A Ceylon specimen of Mrs. Genl. Walker in herb. Kew. is very close to Griffith 2793 save for its being almost glabrous. The range of variation in respect of hairyness is comparable with that displayed by *M. speluncae* and the two extremes are equally entitled to varietal recognition. The type of indumentum differs in the two species, that in *M. firma* consisting of stiffer hairs like those on the strigosely-hirsute rachises.

I wish to thank Professor R. E. Holttum for reading the first draft of this paper and making some helpful comments.

GARDENING BOOKS

The following books have recently been published by W. H. and L. Collingridge, Ltd. :—

(1) **Picture Book of Gardens.***—This " Picture Book " containing 73 illustrations of various types of gardens should prove of interest to all those who are planning to make gardens or who intend to improve or develop existing gardens. We are told in the introduction that there is no better preparation for the planning of a garden than a wide familiarity with other gardens. Certainly the photographs in this book show many styles of gardening and much of what is best in the garden art. They illustrate in an excellent manner what must be regarded as types of greatest beauty in gardens. Mr. Hellyer has selected these photographs with great care and discrimination. They will be welcomed by all garden lovers.

(2) **Garden Making.***—Yet another " Picture Book " in the " Amateur Gardening " series dealing with the making of new gardens or with the problems of gardens that need to be re-designed or improved. The book shows in pictures, with considerable detail, those operations which may have to be undertaken by the amateur gardener. The excellent pictures are very clear and practically self-explanatory, and each is accompanied by a brief descriptive text. The book is a most useful addition to the series.

(3) **Garden Pests and Diseases.***—This small handbook is divided into four chapters, the first of which is devoted to " First Principles ". Chapter 2 lists the pests and diseases alphabetically, while in Chapter 3 will be found the principal garden plants showing the pests and diseases likely to attack them. The last chapter gives an account of the popular remedies which can be employed by the amateur gardener. A useful little book written in a clear and consise manner.

(4) **Fruit.***—As a result of years of experience the author is fully qualified to write with authority on the more important details of fruit culture. The information given is reliable and deals with planning, planting, pruning, management, propagation, pests and diseases, storing, and exhibition at shows. There are over 20 illustrations, all very helpful to the beginner and a selection is given of recommended varieties.

(5) **Strawberries.***—The author deals with the cultivation of strawberries in a thorough and practical manner. Following the introduction there are chapters dealing with soils, propagation, planting, strawberries in barrels, cultivation in the open and under glass, and pests and diseases. In conclusion a list of recommended varieties is given.

H. S. MARSHALL.

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* (1) Amateur Gardening Picture Book of Gardens. By A. G. L. Hellyer. Price 12/6d. 73 photographic illus. 1956.

(2) Garden Making. By G. B. Walkden. " Amateur Gardening " Picture Book Number 6. Pp. 124. 293 photographs and drawings. Price 12/6d. 1956.

(3) Garden Pests & Diseases. By A. G. L. Hellyer " Amateur Gardening " Handbook Number 16. Pp. 92 + 6 illus. 4/-. 1956.

4 Fruit. By Howard H. Crane. " Amateur Gardening " Handbook Number 17. Pp. 92 + 22 illus. 4/-. 1956.

(5) Strawberries. By Norman Stewart. " Amateur Gardening " Handbook Number 18. Pp. 92 + 19 illus. 4/-. 1956.

NOTES ON CYPERACEAE : XLI.*

E. Nelmes

Rhynchospora in Tropical East Africa.

C. B. Clarke recognised eight species of *Rhynchospora* in the Flora of Tropical Africa and five of these have to be included in the Flora of Tropical East Africa, along with several since collected in this area. Four of the five, for one reason or another, require change of epithet. *Rhynchospora*, therefore, is a good example of the need for a radical revision of the *Cyperaceae* of Tropical Africa.

One of the plants referred to above is a new species and this is described below. It was included in *R. wallichiana* C. B. Clarke, an Indo-Malaysian plant with much larger heads of spikes, by Clarke himself in the Flora of Tropical Africa, and it was treated as *R. parva* (Nees) Steud., a species from the Mascarene Islands, by Kükenthal in his Vorarbeiten zu einer Monographie der Rhynchosporoidiae (Engl. Bot. Jahrb. 74 : 489 : 1949).

Rhynchospora minor *Nelmes*, sp. nov. ; affinis *R. parvae* (Nees) Steud. sed setis o vel usque achaenio leviter longioribus, achaeniis minoribus, styli basi depresso-conica breviore pallida praecipue differt.—Typus, Tanganyika, *Fitzgerald* 5217 (K, holotypus, EA, isotypus).

Planta caespitosa. Culmi erecti, 10–50 cm. alti. Folia 1–1·5 mm. lata, conduplicata. Inflorescentia capitata, globosa vel hemisphaerica, bracteata, terminalis, dense plurispiculosa, 5–12 mm. lata, 4–8 mm. longa. Spiculae plures vel subnumerosae, 3–4 mm. longae, una tantum fructifera. Glumae 6–7, brunneae, fructifera 1·8–2·8 mm. longa. Setae 4–6, antrorse scaberulae, inaequales, plerumque brevissimae sed interdum o vel usque achaenio leviter longiores. Stamina 2. Stylus apice subbifidus, basi depresso-conicus, pallidus, glaber. Achaenium obovatum sed inferne acuminatum, apice rotundo-truncatum, 1·2–1·5 mm. longum, brunneum, hispidum, superne laeve vel plus minusve rugulosum.

Sierra Leone : Mano Salija, fairly moist sand, 29 Nov. 1926, *Deighton* 341.

Liberia : Grand Cape Mount Co. ; Robertsport, 28 Dec. 1947, *Baldwin* 10919 ; Montserrado Co. ; Duport, wet and slightly brackish sandy soil, 15 Nov. 1926, *J. Bequaert* in *Linder* 1460 ; savannah east of Monrovia, 31 Aug. 1947, *Baldwin* 9175 ; Grand Bassa Co. ; Grand Bassa, sandy savannah, July 1841, *Vogel* 105.

Spanish Guinea : Corisco Island ; meadow ground, Oct. 1862, *Mann* 1897.

Tanganyika : Mafia Island : Dundani, dominant sedge of bog flanking *Philippia* zone, 7 Aug. 1936, *Fitzgerald* 5217 ; ibid., between Irume and Liwali, sea level, in an *Avicenna marina* salt marsh, very common, 16 Aug. 1937, *Greenway* 5119.

Zanzibar : wet places, April 1874, *Hildebrandt* 1275.

Port. E. Africa : Inhambana ; 1 Feb. 1898, *Schlechter* 12090.

The specimens cited above are in the Kew Herbarium.

* Continued from K.B. 1956 : 182 (1956).

The Tasmanian Flora.*—With the exception of South Australia, the Australian states are without comprehensive modern handbooks to their floras. In the main, the existing floras are both out of print and out of date, so that there is an urgent demand from many quarters for floras that will meet the practical need for plant identification. The appearance of the first of a projected three volumes of Dr. W. M. Curtis' " Student's Flora of Tasmania " is, therefore, a most welcome event. The arrangement is similar to that of Rodway's " Tasmanian Flora ", which the present volume equals in size although it deals with only the gymnosperms and the angiosperms from *Ranunculaceae* to *Myrtaceae*. The discrepancy in size is due partly to an increase in the number of species recognised, but mainly to the more ample descriptions, which, on the whole, are two or three times as long as those of Rodway. Many more introduced and naturalised plants are included and these, also, receive uniform treatment. There are 21 *Trifolium* species compared with Rodway's 9, but only 7 *Medicagos* to his 5. The adventives are distinguished from native species by an asterisk. *Oxalis corniculata* L. ought, surely, to be so marked, since it was probably an early introduction as Rodway claimed. The number of species in many native genera remain unaltered, the gains and losses resulting from the advance of knowledge in their taxonomy and nomenclature cancelling out. *Pultenaea* retains 14 species, one of Rodway's species being relegated to synonymy, while the gap is filled by the recognition of *P. paleacea* Willd. var. *sericea* Benth. in Tasmania.

There is a scattering of line drawings of representative species through the text, which convey very well the appearance of the species, although more dissections of the flowers might have been included. A disproportionate number of drawings has been meted out to *Eucalyptus*, the 25 species sharing seven pages of illustration. No doubt the difficulties of the genus and its great economic importance justify such a course, for there is no better way of conveying the subtleties of form that separate the species. It is all the more necessary that the terminology of the shapes illustrated should conform with that in general use. Exception must be taken to the use of " pyriform " for the shape depicted in Fig. 53. F, which would more accurately be described as " truncate-ellipsoid " similarly, the shape given, in the illustrations to the glossary, as "elliptic" is too narrow and flat sided, a true elliptic shape appearing in the leaflets of the pinnate leaf on the same page (p. xxvii). These small lapses draw attention to the need for a standard atlas of botanical terminology that would serve as a guide for both students and authors. They detract but little from the value of the book as a working flora of the state and one that should give considerable stimulus to botanical studies in Tasmania. It is hoped that the publication of the final volumes will not be long delayed.

R. Melville

* The Student's Flora of Tasmania. Part 1. By W. M. Curtis. Hobart, Tasmania : Government Printer. 1956. Pp. XLII + 234.

NEW OR INTERESTING RECORDS OF AUSTRALASIAN BASIDIOMYCETES : II.

Derek A. Reid

In the present paper *Pseudotremellodendron*, a new genus of the Tremellaceae is described with *P. pusio* as the type species, and it is suggested that the following should be regarded as synonyms of this fungus—viz. :—*Clavaria flagelliformis*, *Thelephora archeri*, and *Tremellodendropsis transpusio*.

These fungi have in the past been regarded as members of the Clavariaceae, and were placed by the old mycologists in the genera *Clavaria* or *Lachnocladium*, with the exception of *L. archeri* which was originally described by Berkeley as a member of the Thelephoraceae in the genus *Thelephora*. Corner (1950) described the genus *Aphelaria* for those clavarioid fungi with monomitic structure and flattened branching, and in it he included these plants. Later (1953) he erected the subgenus *Tremellodendropsis* for these species with clamped hyphae and subtremellaceous basidia, designating *Aphelaria tuberosa* (Grev.) Corner as the type species. This subgenus he distinguished from *Tremellodendron* on the grounds that the basidia were clavate and not truly tremellaceous and that the hyphae possessed clamps and did not become very thick walled. Crawford (1954) raised *Tremellodendropsis* to generic rank, separating it from *Aphelaria* on account of the clamped hyphae and partially or completely cruciately septate apices of the basidia. At the same time she described the new subgenus *Transeptia* for those species in which the apices of the basidia are completely cruciately septate, with *Tremellodendropsis transpusio* as the type species. It is the view of the present author that with the exception of the type species of *Tremellodendropsis* [*T. tuberosa* (Grev.) Crawford] all the species placed by Crawford in this genus have truly tremellaceous basidia and do in fact belong to the Tremellaceae. Consequently the genus *Pseudotremellodendron* is here described with *P. pusio* as the type species.

Pseudotremellodendron *Reid*, gen. nov.

Sporophora clavarioidea, basidiis clavatis dein longitudinaliter et cruciatim septatis, hyphis muros tenues habentibus cum septis fibulatis.

TYPUS *Clavaria pusio* Berk.

Pseudotremellodendron pusio (*Berk.*) *Reid*, comb. nov.

Clavaria pusio Berk. The botany of the antarctic voyage of H.M. discovery ships Erebus and Terror in the years 1839–43 under the command of Captain Sir James Clark Ross, by J. D. Hooker. Part II, Flora Novae Zealandeae, **2,** p. 185, 1855.

Aphelaria pusio (Berk.) Corner. A monograph of Clavaria and allied genera, p. 188, 1950.

Tremellodendropsis pusio (Berk.) Crawford in Trans. roy. Soc. N.Z. **82,** p. 620, 1954.

Clavaria flagelliformis Berk. Flora Novae Zealandeae **2,** p. 186, 1855.

Lachnocladium flagelliforme (Berk.) Cke. Handbook of Australian Fungi, p. 179, 1892.

Aphelaria flagelliformis (Berk.) Corner in Ann. Bot., Lond. new series, **17,** p. 350, 1953.

Tremellodendropsis flagelliformis (Berk.) Crawford in Trans. roy. Soc. N.Z. **82,** p. 621, 1954.

Tremellodendropsis flagelliformis (Berk.) Crawford var. *ovalispora* Crawford in Trans. roy. Soc. N.Z. **82,** p. 621, 1954.

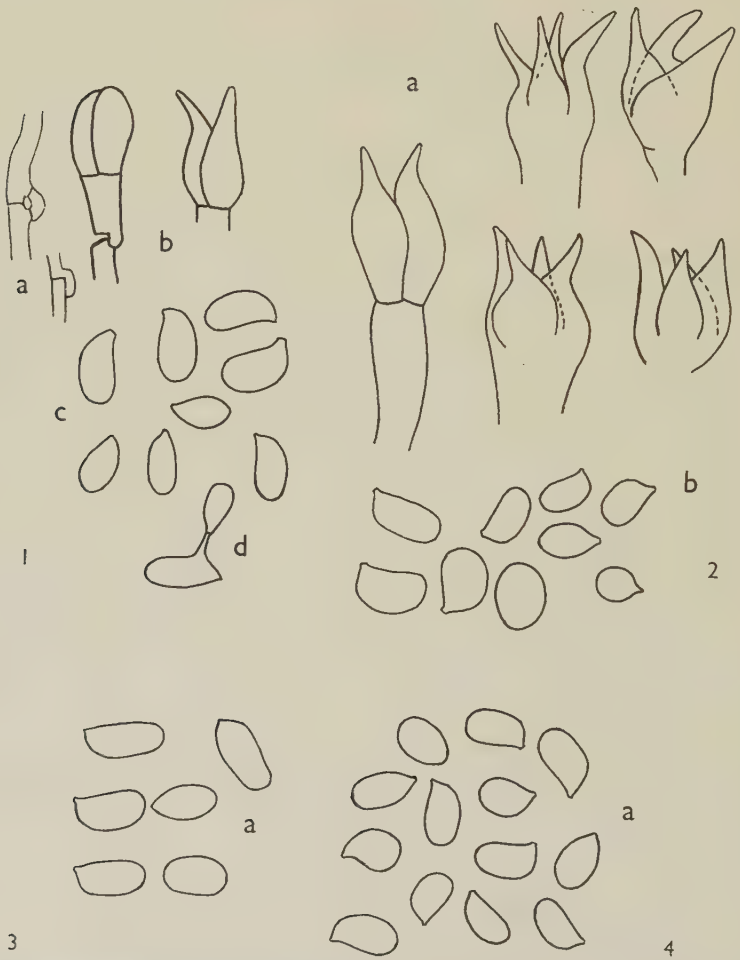

Fig. 1. *Clavaria pusio* : (*a*) clamped hyphae ; (*b*) basidia ; (*c*) spores ; (*d*) germinating spore with attached secondary spore. All from the type specimen. Fig. 2. *Thelephora archeri* (*a*) basidia ; (*b*) spores. Both from the type specimen. Fig. 3. *Thelephora archeri* (*a*) spores from the collection labelled " Delegate Hill, Australia, Leg. E. Reader, Baron Mueller 1880 ". Fig. 4. *Clavaria flagelliformis* (*a*) spores from the type specimen. All × 866.

Thelephora archeri Berk. Flora Tasmaniae **2,** p. 258, Plate 183, fig. 2, 1860.

Lachnocladium archeri (Berk.) Lloyd Mycological Writings **5,** p. 624, 1917.

Dendrocladium archeri (Berk.) Lloyd Mycological Writings **5,** Index p. 13, 1919.

Tremellodendropsis transpusio Crawford in Trans. roy. Soc. N.Z. **82,** p. 624, 1954.

Tremellodendropsis transpusio Crawford var. *minor* Crawford in Trans. roy. Soc. N.Z. **82,** p. 625, 1954.

Tremellodendropsis transpusio Crawford var. *inflata* Crawford in Trans. roy. Soc. N.Z. **82,** p. 625, 1954.

Fruitbodies of the type collection are small, slender, clavarioid plants, up to 1 cm. high, which are once or twice dichotomously branched. The branches are terete except toward the base of the sporophores and just beneath the dichotomies where they are somewhat flattened. In other gatherings, robust, fastigiate specimens up to 7 cm. high occur, in which the lower branching may be polychotomous, and the subsequent dichotomies more numerous than in the type. It is sometimes difficult to trace the mode of branching owing to fusion of adjacent limbs. Fresh specimens vary in colour from white to dull pallid to flesh colour or deep buff, are of tough, fleshy consistency, and have a high water content (Crawford 1954). When dried these fungi become brown and horny-cartilaginous. *Hyphal structure* monomitic, consisting of generative hyphae 2–3·5μ wide, with thin or very slightly thickened walls. These hyphae bear clamps at the septa which may be of a more or less loop-like form. *Hymenium* thickening, reaching 156μ on the main branches of some specimens, but not distinctly layered. *Basidia* 2 or 4-spored, tremellaceous. *Spores* hyaline, smooth, elliptical, but rather variable in both size and shape. Those of the type are 9·5–12 × 4·5–6μ, but the complete range for the species is 9–13 (–16) × 4·5–6·5 (–8·5)μ. *Spore germination* as seen in the type specimen consists of the production of a short pointed sterigma about 5μ long, from which a secondary elliptical spore 8 × 4μ, is produced. *Distribution.* This fungus has been reported under the various names listed above from :—New South Wales, Victoria, Queensland, Australia ; New Zealand ; Tasmania ; Philippines ; Sumatra ; India ; Madagascar ; and Brazil.

Pseudotremellodendron pusio var. **tasmanica** (*Lloyd*) *Reid*, comb. nov.

Pterula tasmanica Lloyd Mycological Writings **7,** 1227, Plate 256 (fig. 2539), 1923.

Aphelaria tasmanica (Lloyd) Corner A monograph of Clavaria and allied genera, p. 191, 1950.

Tremellodendropsis flagelliformis (Berk.) Crawford var. *tasmanica* (Lloyd) Crawford in Trans. roy. Soc. N.Z. **82,** p. 623, 1954.

This variety differs from the type species in its slightly larger spores (10–) 12–17 × 6–9·5μ (fide Crawford).

Crawford (loc. cit.) wrote as follows on the genus *Tremellodendropsis* " Delimitation of the species of *Tremellodendropsis* is difficult ; morphologically they are all very similar, both in the fresh state and even more so when dried. Differences in size, length of stalk, degree of flattening of branches, and compactness of plant have been observed, but the growth form is most probably dependent on environmental conditions. In the related genus *Aphelaria* a similar wide range of growth forms has been

recorded for *A. dendroides*. Spore size is usually regarded as a fairly constant character, but if the basidia produce from one to four spores a wide range in spore size from any one plant might be expected ". These observations are in complete agreement with those of the author. However, Crawford divided the genus into two subgenera on the basis of whether the basidia were cruciately subseptate at the apex, or whether they had a transverse septum cutting off a cruciately septate apical region before spore formation, and then used spore size and shape to distinguish the species. The present author has examined the type specimens of *Clavaria pusio*, *C. flagelliformis* and *Thelephora archeri*, and has found tremellaceous basidia of the kind figured by Crawford (fig. III, p. 624) for *Tremellodendropsis transpusio* in each. The septation is not visible in the very young basidia, and is not easily seen in the old ones which have shed spores, as they collapse readily in hymenial squashes. Even so in these old basidia there is nearly always a constriction at the point where the transverse septum would be expected, and it is sometimes possible to see traces of it projecting from the walls at this point. It is therefore often difficult to find basidia which clearly show complete septation, unless the fruitbody is in the correct stage of development, or unless suitable portions are examined. Nevertheless in some specimens of the type collection of *C. pusio* the basidia are well preserved and the septation easily seen. The description of *T. transpusio* by Crawford was thus quite unjustified, as apart from the structure of the basidium there is complete agreement in spore size (Crawford gave the spores of *T. pusio* as 9–16 × 4·5–7μ and those of *T. transpusio* as 9–15 × 4–7μ).

It has been found that there is exceptionally wide variation in spore size and shape in any one fruit-body. This is probably due in part to basidia producing from one to four spores as Crawford suggests, but in very few of the collections examined was there any close approach to the uniformity of spore size and shape as shown (fig. I, p. 620) for her various taxa. Indeed the spores of the type specimen of *C. flagelliformis* exhibited particularly wide variation in shape, with a high percentage showing the ovoid form of her var. *ovalispora*, and she herself states that the spores of this variety vary from subcylindrical to subglobose. There is considerable variation also in the size and shape of the spores of *Thelephora archeri* in which the majority are 9–12 × 4·5–6μ, but a few are 11 × 7·5–8μ. Spore measurements in these fungi are further complicated by spore germination with the production of smaller secondary spores on the parent plant. This may account for the lower range of spore size given by Crawford for *T. flagelliformis*, especially as she shows (fig. I (c), p. 620) a spore of *T. flagelliformis* var. *tasmanica* which has germinated to produce a typical pointed sterigma. With the exception of the var. *tasmanica*, in which the spores appear to be somewhat larger, it seems pointless to retain varieties based on these variable spore characters.

With regard to the type of *Thelephora archeri* it should be noted that Corner (1950) stated that " *Lachnocladium archeri* (Berk.) Bres. = *Thelephora archeri* Berk." and Cunningham (1953) wrote " The type labelled " Tasmania ", was referred by Bresadola to *Lachnocladium* ; but Corner (1950, p. 723) correctly showed it to be a *Thelephora*. A second collection on the type sheet ex " Delegate Hill, Vic., E. Reader ". may be the same, but this could not be ascertained since spores were not found ". It is

difficult to see why these collections should have been referred back to the genus *Thelephora*, as the elliptical spores are quite smooth, and hyaline or very faintly yellowish when mounted in potassium hydroxide, and the basidia are tremellaceous.

Crawford, discussing the systematic position of the genus *Tremellodendropsis*, writes as follows " Some authors would probably place *Tremellodendropsis* in the Tremellaceae, regarding the partial or complete septation of the apical region of the basidium as anomalous for the Clavariaceae ; the subgenus *Transeptia* might even be placed in the Auriculariaceae because of the transverse septation. However, transverse septation of old basidia occurs not only in members of the subgenus *Tremellodendropsis* but also in other members of the Clavariaceae—e.g., *Clavulina*. It is therefore not unreasonable to suppose that the time of septation occurs earlier in the young basidia of the subgenus *Transeptia*. The members of the genera *Aphelaria* and *Tremellodendropsis* form a sequence from the nonseptate elongate clavate basidium, through the still elongate clavate but partially septate basidium, to the " Transeptia " basidium where the apical portion is cut off by a transverse septum to give a cruciately septate region. All these basidia differ from the typical Tremellaceous basidia in still being clavate not globular. The genus *Tremellodendropsis* provides a link between Clavariaceae, Tremellaceae and Auriculariaceae ". In any consideration of the systematic position of these fungi the structure of the basidium assumes the greatest importance and so it is essential that a clear idea be formed of how the basidium develops. The clavate probasidium is cut off by a clamped basal septum, and continues to enlarge. A secondary septum which lacks a clamp connexion is then formed cutting off an apical portion which becomes longitudinally septate and functions as the basidium proper, and a basal portion which functions as a stalk cell. Crawford considers that in the " Transeptia " type of structure described above (and according to the present author the only type found in *Pseudotremellodendron*) the term basidium should include both the longitudinally septate apical portion and the stalk cell. In the view of the present author, however, the term basidium should be restricted to the apical segment, but it seems probable that this type of reproductive structure is a primitive one in the Tremellaceae. Crawford attaches great importance to the shape of the basidia in *Tremellodendropsis*, and states that they " differ from typical Tremellaceous basidia in still being clavate, not globular ". Whilst this is true, it must be remembered that the tremellaceous fungus *Eichleriella spinulosa* (Berk. and Curt.) Burt possesses basidia which are far more strongly clavate than those found in *Pseudotremellodendron pusio*. McGuire (1941) described two species of *Sebacina* (*S. podlachica* Bres., *S. umbrina* Rogers) which have exactly comparable basidia to those described above. He writes of *S. podlachica* " probasidia at first clavate, with basal septa and clamps 5–15μ below the swollen tips, tardily cut off by secondary septa at the bases of the swollen tips, finally obovate, ... ", etc. He adds " The great variation in basidium sizes cited by Bourdot and Galzin is probably due to the fact that the secondary basal septa are often very difficult to see. It may be that they sometimes fail even to develop, ... ", etc. Martin (1941) has also described similar basidia in *Protohydnum cartilagineum* A. Möll., he writes " The basidia are as Möller describes them, but he fails to

emphasize sufficiently their unusual character. The probasidia are at first long clavate (fig. 10), 30–35μ in length. The terminal portion becomes greatly swollen and more or less globose, and finally is cut off from the basal stalk, the swollen portion only becoming divided by oblique or longitudinal septa ". His figures, like those of McGuire, show no clamp at the septum between basidium and stalk cell. Again in *Sebacina prolifera* Rogers the basidia are rather similar to those of *Pseudotremellodendron* and Rogers (1936) writes of this fungus " It differs from all species of *Sebacina* known to the author in the broadened subbasidial cell." The only differences from the *Pseudotremellodendron* basidium are that the septum between basidium and subbasidial cell is clamped, and that subsequent basidial proliferation occurs from this clamp connexion. This probably represents a more advanced type of reproductive structure in which the secondary septum of *Pseudotremellodendron* has been replaced by one that is primary and clamped. In all genera of the Clavariaceae where the basidium becomes transversely septate, this occurs after spore discharge, and is comparable with the formation of secondary septa in the vegetative hyphae, whereas in these fungi it occurs before spore discharge, and forms part of the reproductive structure. In addition to the structure of the basidium, and nearly as important when deciding to which group of fungi *Pseudotremellodendron* should be assigned, is the method of spore germination. In no genus of the Clavariaceae does the spore germinate directly to produce a secondary spore, but this is a common occurrence in the Tremellaceae. In this connexion it should be noted that Crawford figures (fig. I (c)) a germinating spore of *T. flagelliformis* var. *tasmanica* which has produced the characteristic pointed sterigma which in *T. pusio* has been shown to bear the secondary spore, and this in a taxon which she maintains has clavate basidia which are only " cruciately subseptate at the apex." In view of this evidence the author considers that *Pseudotremellodendron* should be placed in the Tremellaceae. He cannot take seriously Crawford's suggestion of a possible relationship with the Auriculariaceae, from which this genus differs very widely.

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COMMIPHORA DALZIELII Hutch.

C. D. Adams

Among the lesser known, locally distributed, and possibly endemic shrubs and small trees of the Accra Plains, *Commiphora dalzielii* Hutch. (Burseraceae) is one for which an adequate description is lacking. Such a species, on account of the dioecious habit, the small flowers easily lost during pressing, the spiny branches and the long period of time elapsing between the appearance of the flowers and the maturation of fruit, besides its scarcity, is almost invariably represented in herbaria by poor, incomplete material, and repays careful field study.

The following description is compiled from the observation of several specimens in two stations within the grounds of the University College of the Gold Coast around Legon Hill over a period of six months. In both places the plants occurred at the margins of undisturbed thicket in association with *Uvaria ovata*, *Baphia pubescens*, *Carissa edulis*, *Jasminum dichotomum*, *Jasminum pauciflorum*, *Gardenia ternifolia*, *Sorindeia warneckei* and other of the more common thicket shrubs and climbers. There was only one female plant in one of the stations, and three, two male and one female, in the other.

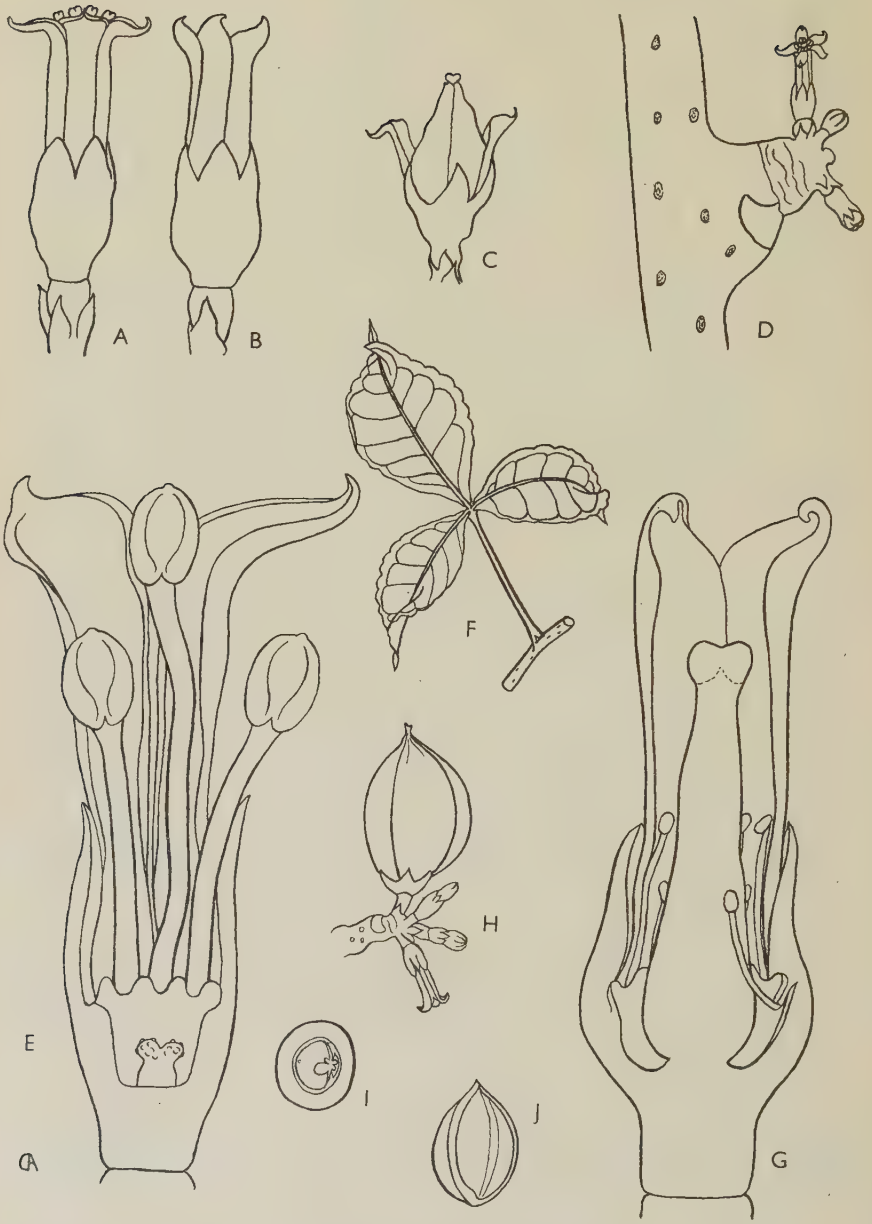
The dense impenetrable growth of this species has a smothering effect on surrounding plants and allows no ground flora beneath it. For this reason, and the fact that all the leaves have usually dropped before grass fires are imminent, *Commiphora dalzielii* is little affected by burning. Owing to the spiny nature it is not cut for firewood, although the dead twigs are collected and burn well. The flowers are visited by ants which may transfer pollen, but fertilization of the flowers of isolated female plants is not easily explained in this way. On the other hand the fruit yield of the one isolated female specimen under observation was extremely poor. The interior of the dense growth of a single plant is a favourite haunt of small bats. The nature of the fruit suggests dispersal by birds.

Male plants begin to flower as leaf-fall coincides with the onset of the main dry season. Female plants begin to flower about two weeks after the male and both sexes continue while the plants are quite without leaves. With the earliest rains at the end of January or early February leafing commences and by the time fruits are matured considerable new growth has occurred.

Commiphora dalzielii *Hutch. in Hutch. & Dalz.*, Fl. W. Trop. Afr. ed. 1, **1,** 488 (1928) in clav.—Kew Bull. **1929,** 25 (1929).—Irvine, Pl. G.C. 127 (1930).

Commiphora sp., Irvine, Pl. G.C. 127 (1930).

Hutchinson distinguishes this species from *C. africana* Engl. by the glabrous obscurely crenate leaflets and the longer petioles. The petioles of *C. dalzielii* are in most specimens not as long as those of the type, but are usually about as long as the terminal leaflet. This species is probably nearer to those which Engler included in the "Artengruppe" *Schimperianae* characterized by the leaves being constantly trifoliolate and glabrous and with the leaflets rather broad, more or less obovate, and often



Commiphora dalzielii Hutch.

A Male flower × 8. B Female flower × 8. C Young fruit × 5. D Portion of branch with male inflorescence × 2½. E Male flower with half calyx, two petals and five stamens removed to show rudimentary ovary × 20. F Leaf × ½. G Female flower with half calyx, two petals and two rudimentary stamens removed × 20. H Female inflorescence with fruit × 2. I Transverse section of immature fruit to show the abortion of one ovule in the fertile loculus and both ovules in the other × 2. J "Stone" × 2.

with acute tips. It thus resembles *C. samharensis* Schweinf. with much smaller leaves, and *C. campestris* Engl. also with smaller but relatively broader leaflets and longer fruiting pedicels. The species *C. stolonifera* Burtt is also near but this has a branched inflorescence and the foliage is not invariably glabrous. *C. dalzielii* does not root spontaneously from the lower branches.

Deciduous, entirely glabrous, much-branched shrub or small tree, 10 to 25 ft. high, with branches mostly at rightangles to the axes of the stems. Young branches smooth with numerous small rounded lenticels, reddish and shiny near the growing tip, becoming green. Short lateral branches arising from the stem of previous season's growth spinescent, 1·5 to 4·0 cm. long, bearing at first 2 to 4 leaves. Spines occasionally again branched.

Leaves and stems strongly resinous and aromatic, the cortex of young stems and the inner bark of older stems containing resin ducts. The bark of older stems peels in thin transverse silvery-grey flakes exposing the green underbark. The older stems are often clothed with bright green lichens.

Leaves trifoliolate, numerous, alternate. Petioles slender, 1·5 to 5·5 cm. long, straight, finally disposed at right angles to the stem, rigid distal to a small flexible basal pulvinus. Leaflets sessile, the terminal about the same length as or slightly shorter than the petiole, up to 6·0 cm. long and 3·5 cm. broad, the lateral smaller ; ovate, broadly acuminate, with the distal margins shallowly crenate, often slightly twisted towards the tip, of thin texture, with about 6 pairs of lateral nerves looped well within the margin, the terminal broadly and abruptly cuneate at the base, the lateral rather more rounded.

Plants strictly unisexual without vegetative distinction.

Inflorescences produced at the ends of terminal or short axillary branches. Flowers in simple clusters, subsessile on short thick pedicels bearing two or three minute triangular bracteoles. Calyx 2·3 mm. long, with 4 (rarely 5) acute, valvate lobes about 0·5 mm. long, green. Petals 3·0 to 3·5 mm. long, 4 (rarely 5), free, alternating with the sepals, valvate, linear, rather fleshy, separating only at the tip and there reflexed and minutely hooked, yellow, tinged with red along the margins and at the tips.

Tetramerous male flowers with 8 free stamens in two series inserted outside the coroniform disk, the longer opposite the sepals and the shorter opposite the petals, the longer hardly exserted. The male flowers have a minute glandular rudimentary ovary, about 0·3 mm. long, situated in a central depression of the receptacle.

Tetramerous female flowers with a central terete conical ovary 2·5 to 2·6 mm. long having a shortly bilobed stigma at the tip. The female flowers have 8 rudimentary stamens in two series homologous with those of the male flowers.

Fruit 1·0 cm. long, drupaceous, obliquely ovoid, flatter on one side than on the other, minutely apiculate, with four shallow sutures, smooth, green, becoming red when mature. Mesocarp fleshy, dehiscing and separating from the endocarp or withering in situ. Calyx persistent.

The solitary " stone " remains firmly attached to the pedicel and comprises the woody endocarp consisting of the inner parts of the walls of the two loculi, in one of which only one ovule matures. Seed large with a membranous brownish testa. Embryo with foliaceous contortuplicate cotyledons.

Gold Coast. Winneba Plain, amongst clumps of shrubs ; Feb. (fr.), *Dalziel* 8296 (typus). Accra Plains ; *Irvine* 406. Ibid. ; in Uvaria thicket, Achimota to Legon path ; Apr. (fr.), *Irvine* 1609. Ibid. ; thickets, Achimota ; Feb. 1934 (fr.), *Irvine* 2118. Ibid. ; Legon Hill, at margin of thicket below western slope ; Nov.–Jan. (fl.), Feb.–Apr. (fr.), *Adams* s.n. (spirit K) ; 1st Nov. 1955 (no fl. or fr.), *Adams* 3521. Ibid. ; 26th Nov. 1955 (male fl.), *Adams* 3577. Ibid. ; 11th Dec. 1955 (male fl.), *Adams* 3556. Ibid. ; 14th Feb. 1956 (fr.), *Adams* 3756. Also observed in the Legon Botanic Garden area east of Legon Hill and near mile 18 on the Ada road.

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(1) **Simple Flower Arrangement.***—This book is full of suggestions neither expensive nor difficult to follow. Here we may learn of the many flower arrangements which may be made from wild or garden materials or from florists flowers ; useful hints are also given on how to develop a style of one's own. Practical details abound for the use of vases, jugs, baskets and other containers, and all who enjoy arranging flowers, whether they buy or grow them, will be stimulated by reading this book and studying its many illustrations to try new effects. Instructions for the use of material such as wire-netting, false stems, plasticine, Florapak and T-holders are given. This is a useful and interesting book for those who practise the art of floral arrangement.

H. S. Marshall.

(2) **Garden Work.***—This book, as stated in the preface, forms a pictorial guide to garden operations and clearly indicates for the amateur the work to be undertaken in the garden throughout the twelve months of the year. It is illustrated by 118 line drawings, originally published in the pages of " Amateur Gardening ", showing 118 tasks to be done, each drawing accompanied by explanatory text. Such a well illustrated guide will be welcomed by all amateur gardeners who will find it most useful.

H. S. Marshall.

(1) * Simple Flower Arrangement. By Violet Stevenson. London : W. H. & L. Collingridge Ltd. 1956. Pp. 80 + illus. Price 12/6.

(2) * Garden work for the week. Edited by A. G. L. Hellyer. London : W. H. & L. Collingridge Ltd. 1956. Pp. 128. Price 7/6.

NOTES ON THE FLORA OF CYPRUS : I.

R. D. Meikle

Problems, taxonomic and nomenclatural, are bound to arise during the preparation of a detailed Flora of Cyprus, and, as it is intended to publish this work complete, and not in parts, it seems advisable that notes and comments on such problems should be printed separately in advance of the Flora.

The following notes are thus the beginning of what, it is hoped, will become a series as work on the Flora proceeds. The author is grateful to several botanists, both in Cyprus and in Britain, for suggestions and advice, and must especially thank Mrs. E. W. Kennedy, Mr. Edwards C. Casey and Mr. L. F. H. Merton both for help in collecting additional material of " problem " plants, and for directing attention to matters which might otherwise have been overlooked.

RANUNCULACEAE

Ranunculus millefoliatus *Vahl* ssp. **leptaleus** (*DC.*) *Meikle*, stat. nov.

R. leptaleus DC., Regn. Veg. Syst., **1** : 258 (1817) ; Kotschy, Die Insel Cypern, 316 (1865) ; Boiss., Fl. Orient., **1** : 35 (1867) ; Holmboe, Veg. Cypr., 81 (1914).

Type : " in insula Cypro ", 1787, *Labillardière* (Fl).

Typical *R. millefoliatus* Vahl from Carthage (Symb. Bot. **2** : 63, t. xxxvii) differs from the Cyprian plant in its stouter habit, finely dissected leaves, and large flowers (2–3 cm. diam. against 1·5–2 cm. diam. in ssp. *leptaleus*). The carpel difference stressed by Boissier (Fl. Orient. *loc. cit.*) is less satisfactory particularly in view of the fact that *R. millefoliatus* is distinctly variable in this respect. To treat these two taxa as distinct species seems to obscure their very obvious and close affinities, and, for this reason, I have preferred to reduce *R. leptaleus* DC. to the status of subspecies. The Cyprian specimens differ uniformly and consistently from *R. millefoliatus* Vahl ssp. *millefoliatus* in the characters set out above, but southern European material of ssp. *millefoliatus* does occasionally approach ssp. *leptaleus* in having fewer, broader, leaf-divisions, though generally retaining the robust habit and large flowers of typical *millefoliatus*.

PAPAVERACEAE

Papaver minus (*Boiv. ap. Bélanger*) *Meikle*, comb. nov.

Closterandra minor Boiv. ap. Bélanger, Voy. aux Indes-Orient, t. 3, fig. B. (1834–36).

Papaver belangeri Boiss., Fl. Orient., **1** : 117 (1867) ; Fedde in Engl. Pflanzenr., **4,** 104 : 330 (1909) ; Takhtadzhyan, Fl. Armen., **1** : 255, t. LXXII (1954).

Type : Persia, 1825, *Bélanger* (Fl, G, P).

The excellent illustration (with analyses) in Bélanger's *Voyages* leaves no doubt as to the identity of Boivin's *Closterandra minor*, and establishes the validity of the name. Since the epithet *minus* does not seem to have been used for any other *Papaver* species, there would not appear to be any

good reason for neglecting to make the combination, despite the fact that *Closterandra minor* was published without a verbal diagnosis.

The species has long been confused with *P. argemone* L., an excusable error in view of the very close similarity in appearance, but I feel a distinction should be made, based on the characters set out below :

P. argemone *L.*	**P. minus** (*Boiv. ap. Bélanger*) *Meikle*
Stems usually erect or ascending.	Stems usually decumbent or spreading.
Flowers opening widely.	Flowers funnel-shaped.
Petals pale scarlet or orange-red, not contiguous.	Petals crimson or crimson-scarlet, contiguous or overlapping.
Fruiting peduncles slightly thickened.	Fruiting peduncles conspicuously thickened.

Papaver argemone is distributed throughout the temperate regions of western Europe, from the British Isles eastward to Hungary and Italy (and, more doubtfully, to Yugoslavia and Thrace). It is replaced further east by *P. apulum* Ten. (? France, Italy, Sicily, Yugoslavia, Greece, Crete) ; *P. nigrotinctum* Fedde (Greece, Aegean Islands) ; *P. virchowii* Asch. et Sint. (Aegean Islands, Turkey) and *P. minus* (Boiv. ap. Bélanger) Meikle (Cyprus, Palestine, Syria, Turkey, Armenia, Iraq, Persia).

Small, starved specimens of *P. minus* are commonly erect and unbranched without the characteristic, cup-like habit (formed by the radiating decumbent branches) of the fully developed plant. Such depauperate plants can normally be distinguished by the flower-shape and colour (where noted) and by the distinctly thickened fruiting peduncles. Cyprian specimens tend to have very sparsely hispid capsules, and finely dissected leaves, but the differences are scarcely sufficient to justify nomenclatural recognition.

Hypecoum imberbe *Sibth. et Sm.*, Prodr. Fl. Graec., **1** : 107 (1806) ; Fl. Graec., **2** : 47, t. 156 (1813) ; Holmboe, Veg. Cypr., 84 (1914).

H. grandiflorum Benth., Cat. Plant. Pyren., 91 (1826) ; Unger & Kotschy, Die Insel Cypern, 322 (1865) ; Boiss., Fl. Orient., **1** : 125 (1867) ; Fedde in Engl. Pflanzenr., **4,** 104 : 91 (1909) ; Holmboe, Veg. Cypr., 84 (1914) ; Post, Fl. Pal., ed. 2, **1** : 40 (1932).

Type : " In insula Cypro ", 1787, *Sibthorp* (OXF) !

Most authors from Boissier onwards have considered *Hypecoum imberbe* Sibth. et Sm. synonymous with *H. aegyptiacum* (Forsk.) Ashers. & Schweinf. in Mém. Inst. Egypt., **2** : 37 (1887) (*Mnemosilla aegyptiaca* Forsk., Fl. Aegypt.-Arab., 122, 1775). Examination of Sibthorp's type material, and of the fine illustration (*cit. supra*) in the *Flora Graeca* shows that this identification is mistaken. True *H. aegyptiacum* (Forsk.) Aschers. & Schweinf. is a most distinctive species, with the inner petals blotched violet at the base (as shown under the name *Hypecoum patens* in Willd., Hort. Berol., t. 5, 1803), and with slender, inconspicuously articulated fruits. The plant depicted in the *Flora Graeca* has wholly yellow flowers, and relatively stout fruits, prominently articulated with conspicuous

constrictions between each pair of articulations, as in *H. grandiflorum* Benth. The Sibthorp type-material is without flowers, but the fruits are exactly as shown in the *Flora Graeca* illustration, and there is little doubt that the plant should be regarded as conspecific with *H. grandiflorum* Benth. and distinct from *H. aegyptiacum* (Forsk.) Aschers. & Schweinf. The epithet "*imberbe*" and the statement that the inner petals are without a fringe of hairs are puzzling, for the inner petals of *H. grandiflorum* are usually ciliate. The explanation may be that Bauer (? by mistake) illustrated glabrous inner petals in his analysis of *H. imberbe*, and that Smith put too much faith in the accuracy of the illustration when describing the plant—for one must presume that Smith had to rely solely on the illustration for data on the floral structure of the species.

True *H. aegyptiacum* (Forsk.) Aschers. & Schweinf. is apparently confined to Egypt and S. Palestine, and has not been collected in Cyprus. *H. imberbe* Sibth. et Sm. (*H. grandiflorum* Benth.) is widespread throughout S. Europe and the Mediterranean region, and is fairly common over most of Cyprus.

CONVOLVULACEAE

Convolvulus oleifolius *Desr.* in Lam., Encycl. Méth. **3** : 552 (1791) as *C. oleaefolius* ; Kotschy, Die Insel Cypern., 285 (1865) ; Boiss., Fl. Orient., **4** : 93 (1879) ; Holmboe, Veg. Cypr., 145 (1914) ; Post, Fl. Pal., ed. 2, **2** : 204 (1933) ; Chapman, Cyprus Trees and Shrubs, 62 (1949) ; Rechinger f. in Arkiv. för Bot., ser. 2, **1** : 429 (1950) ; Seligman in Quart. Bull. Alpine Gard. Soc., **20** : 228 (1952).

[*C. cyprius* (non Boiss., Fl. Orient., **4** : 93, 1879) Lindberg f., Iter Cypr. in Act. Soc. Sc. Fenn., ser. B, **2** : 27 (1946) ; Chapman, Cyprus Trees and Shrubs, 63 (1949) ; Seligman in Quart. Bull. Alpine Gard. Soc., **21** : 202 (1953)].

Cyprus material of *C. oleifolius* Desr. in the Kew collection has been frequently mislabelled *C. cyprius* Boiss.—an error due partly to imperfect knowledge of Boissier's species, and partly to a failure to appreciate the wide range of variation found in *C. oleifolius*.

Cyprian specimens fall into three groups :

Group A. Spreading or decumbent leafy subshrubs (10–) 15–25 (–40) cm. high ; leaves narrowly oblanceolate or almost linear, 3–5 cm. or more long, up to about 1 cm. wide, silvery-sericeous or occasionally greenish ; inflorescences arising mostly from the upper leaf-axils, usually rather dense, sub-capitate ; bracts and calyx fuscescent, conspicuously villose, with long, spreading, silvery hairs.

Group B. Rigid, ± erect, much-branched shrubs (10–) 15–40 cm. high, the branches often leafless towards the base ; leaves narrowly linear, 1–1·5 cm. long, about 2 mm. wide, silvery-sericeous ; inflorescences often rather lax and branched ; bracta and calyx with rather short, spreading, silky hairs.

Group C. Dwarf, much-branched shrublets 3–10 cm. high forming dense, rounded tufts 5–10 cm. diam., leaves small, oblanceolate 1–2 cm. long, up to about 6 mm. wide, conspicuously silvery-sericeous ; inflores-

cences sub-capitate, usually few-flowered ; bracts and calyx with short, spreading silky hairs.

Provisional names for all three groups can be found in literature, but it must be emphasized that final determinations can only be made after careful examination of the relevant type-material.

Group A seems to represent typical *C. oleifolius* Desr. (including var. *angustifolius* Bég. et Vacc. and f. *stenophyllus* Maire et Weiller). It is widespread and variable in Cyprus, occurring in many parts of the Karpas ; in the Northern Range about Kantara ; in the Akamas and about Ktima and Paphos, and also about Cape Gata near Limassol (the type locality for *C. cyprius* Boiss.).

Group B is apparently very closely allied to *C. oleifolius* Desr. var. *deserti* Pamp. (Archivio Bot., **12** : 40, 1936) ; it has been collected in one locality only in Cyprus—at Athalassa in the Mesaoria, about 5 miles S.E. of Nicosia, but it may be more widespread than the records would suggest.

Group C agrees with the brief diagnosis of *C. oleifolius* Desr. var. *pumilus* Pamp. (Archivio Bot., **12** : 41, 1936). It was first collected in Cyprus by Dr. R. Seligman (Quart. Bull. Alpine Gard. Soc., **20** : 228, 1952) and is seemingly confined (in Cyprus) to sand dunes and sandy ground in the neighbourhood of Ayia Irini on the north coast near Morphou. Dr. Seligman first (and correctly) referred his plant to *C. oleifolius*, but subsequently, and, I regret to say, on the advice of Kew (see Quart. Bull. Alpine Gard. Soc., **21** : 202–205, 1953) was induced to re-name it *C. cyprius*, though not without some reservations, which were mentioned in a later volume of the same Bulletin (Quart. Bull. Alpine Gard. Soc., **22** : 358, 1954). The Ayia Irini plant is by far the neatest and most attractive of *C. oleifolius* varieties, and is well worth space in the alpine-house, though rather difficult to overwinter in our moist, foggy climate. Living specimens at Kew (unfortunately no longer alive) remained dwarf and tufted in cultivation, but further experiment is required to prove that the plant's caespitose habit has a genetical basis.

Through the courtesy of Dr. K. H. Rechinger, I have been able to examine authentic material of *C. cyprius* Boiss. (from Cyprus, " ad Lamnias in Capo Gatto " [Cape Gata], May 1, 1862, *Kotschy* 627), and find that while it resembles small forms of *C. oleifolius* Desr. in habit and leaf-shape, it differs from all segregates of this species in the closely adpressed calyx indumentum—a feature stressed by Boissier in his original description (Fl. Orient, **4** : 93, 1879). It would also appear to be less woody than *C. oleifolius*, the growths seeming to die back annually to near the rootstock ; the flowers are borne in loose clusters, arising from the upper leaf-axils. All these characters (adpressed calyx indumentum, herbaceous mode of growth, and scattered, few-flowered inflorescences) are found in *C. lineatus* Nathhorst (Fl. Monspel., 11, 1756) and indeed it may be questioned if Kotschy was not correct in regarding his plant as a variety of this species (*C. lineatus* var. *angustifolius* Kotschy, Die Insel Cypern, 285, 1865—*nomen*). *C. cyprius* has narrower leaves than genuine *lineatus* and is not quite so obviously herbaceous, nor are the inflorescences quite so lax and scattered as in that species—in other words, *C. cyprius* is somewhere intermediate between *C. lineatus* and *C.*

oleifolius. Is it possibly a hybrid between these two species ? *C. cyprius* grows with *C. oleifolius* at Cape Gata, and, even more suggestive, *C. lineatus*, or a plant very closely allied to it, grows intermixed with *C. oleifolius* in the same locality, and has been collected with *C. oleifolius* on two separate occasions (May 1951, *Mavromoustakis* 23 ; April 1954, *Seligman and Scott-Moncrieff* in *Casey* 1654). A similar plant, perhaps slightly more akin to *C. oleifolius*, has been collected on sandy banks at Akrotiri near Limassol (in the same area as Cape Gata) by Dr. P. H. Davis (May 22, 1941, *Davis* 3573). Two specimens of typical *C. cyprius* are mounted with, and labelled *C. oleifolius* on a Kew sheet of *Kotschy* 480 ("Inter Cerinia et Lapithos ad margines fruticetorum die 17. Aprilis" 1862) ; here it is possible that two collectings (*Kotschy* 627—*C. cyprius* and *Kotschy* 480—*C. oleifolius*) may have been accidentally mixed before despatch to Kew.

None of the material mentioned above can be referred to *C. lineatus* Nathhorst with absolute certainty, but collectors are particularly requested to look out for this species in Cyprus. It is superficially similar to small decumbent forms of *C. oleifolius*, but the stems are quite herbaceous, with solitary flowers or few-flowered inflorescences arising at intervals from leaf-axils along the greater length of each stem ; the calyx is clothed with a closely adpressed, silky indumentum.

Lily Year Book.*—The twentieth number of the Lily Year Book has recently been issued by the Royal Horticultural Society. A portrait of Monsieur Edouard Debras, to whom this volume is dedicated, forms the frontispiece for this issue. Monsieur Debras will be remembered as the originator of the hybrid lily *Lilium* × *aurelianense* which arose through crossing *L. sargentiae* with *L. henryi*. An account of Debras is given on page 9.

The Lily Year Book is, as usual, full of interesting papers of a high order. It contains an important paper on the history of the Easter Lily (*Lilium longiflorum*) by Lawrence Ogilvie, descriptions of new lilies from the Pacific Coast by Lawrence Beane, and an article on lilies for the rock garden by Will Ingwersen. There are also contributions on lilies in New Zealand contributed by Dr. T. Fletcher Telford, A. C. McKillop and J. C. Morris, lilies in Australia by Gilbert Errey and Gordon M. Chandler, lilies in Northern Transvaal by S. V. Gilkison and Californian lilies by Dr. Vollmer. The volume is furnished with excellent photographic illustrations. The Royal Horticultural Society is to be congratulated on the publication of this interesting Year Book which maintains the high standard that has marked previous issues in this series.

H. S. Marshall.

* The Lily Year Book, 1957. No. 20. London : Royal Horticultural Society. 1956. Pp. 148, illus. Price 10/-.

Fruit Growing.*—This book which is said to represent a new approach to the subject of fruit growing for commercial purposes, has been produced under the general editorship of Professor T. Wallace, Director of the Long Ashton Agricultural and Horticultural Research Station and Mr. R. G. W. Bush, who has a vast knowledge of the subject backed up by wide practical experience.

The fruit growing industry generally will be interested in this work which is both instructive and practical. In the four parts into which the book is divided a mass of research data and detailed information is presented which will no doubt render it a standard work on the subject for some years to come.

In the first part, devoted to basic subjects, there are chapters on climate and site, soils, mineral nutrition, planting materials, fungicides, machinery and equipment. The second part, dealing with the cultural aspect, discusses recommended varieties, planting systems, shaping and pruning, the control of pests and diseases, harvesting, marketing and storing. The third part is devoted to the culture of soft fruits, while the fourth contains information on genetics, new varieties and virus diseases of fruit plants. There is much of practical value here to fruit growers, arranged in a series of chapters on particular subjects by recognized authorities.

The danger of the extensive damage to trees which may result from frost is emphasized. In this connection it is interesting to note that the raising of air temperature by heat inversion is still the best anti-frost measure to adopt where the trees are planted in a depression, on level ground, or surrounded by hedges. It is of course better to plant on a site which can normally be expected to be frost-free and this should be taken into consideration by those starting from scratch.

The successful management of a fruit farm depends in a large measure on the machinery and equipment available. Chapter 7 contains useful advice on the correct equipment to employ and examples of the requirements of large and small fruit farms are reviewed, while lists of major items of equipment for tree fruits and special equipment for soft fruits are given.

The damage done by insects, fungi and other parasites is often considerable and it is therefore necessary to deal with these pests effectively. Chapter 13 contains a concise practical description of the more important insect pests and diseases attacking orchard crops in Great Britain with spray schedules recommended for their control.

The volume is illustrated with 141 well chosen illustrations, and provided with a good index. By its excellence and clearness of arrangement this work will be appreciated by all those whose interests lie in commercial fruit growing.

H. S. Marshall.

* Modern Commercial Fruit Growing. Edited by T. Wallace & R. G. W. Bush. Country Life Ltd., W. H. & L. Collingridge Ltd., London, 1956, pp. 384 + 141 illus. Price 5 guineas.

ON THE NATURE AND POSSIBLE RELATIONSHIPS OF THE FERN GENUS PLATYZOMA R. BR.

R. E. Holttum

This genus, consisting of a single species native in Queensland and Northern Australia, has always been included in the family *Gleicheniaceae*, and Christ even united it to *Gleichenia*, a procedure in which he was followed by Diels and Christensen. But when McLean Thompson made a careful morphological and anatomical examination of the species (1916, 1917), he found many striking differences from *Gleichenia*, so that, in his opinion " it seems quite impossible to retain a view of close affinity ". These differences, and some others not noted by Thompson, are set forth in the following paragraphs.

Rhizome. The vascular system in *Platyzoma* is a medullated protostele, with an inner endodermis ; leaf-traces are joined externally to the xylem of the stele (i.e., there are no leaf-gaps). In all other members of the *Gleicheniaceae* of which the anatomy has been investigated, the rhizome has a simple protostele, except *Gleichenia pectinata* (Willd.) Pr., which has a solenostele with normal leaf-gaps. Externally the rhizome of *Platyzoma* is covered with a dense growth of long multicellular simple hairs. Scattered hairs of this nature occur on the erect rhizome-branches of *Stromatopteris*, but the main protection in this genus is by scales ; in all other members of the family protective hairs are stellate or variously branched, whether on rhizome or frond.

Fronds. The fronds of *Platyzoma* are very close together on the rhizome ; in most members of *Gleicheniaceae* they are widely spaced. Very slender filiform fronds, and transitions between these and normal pinnate fronds, are present regularly in *Platyzoma*, but absent in other genera.

Pinnae. The small pinnae of *Platyzoma* are attached to the rhachis only by the bases of their midribs (the lower ones are even shortly stalked) ; in all other members of *Gleicheniaceae* the ultimate lobes of the lamina are attached to the rachis by a broad base, or are more usually confluent with each other at the base. The reflexed margins of the pinnae of *Platyzoma* bear close short hairs or papillae ; nothing like this occurs in those species of *Gleichenia* which have similar reflexed margins of leaflet-lobes (e.g., *G. circinnata* Sw.). The under-surface of the lamina of *Platyzoma* bears yellow waxy powder ; this was noted by Robert Brown in 1810, but seems to have been quite ignored by later authors. No such waxy powder occurs in any other member of the family.

Sporangia. These are borne singly at the apices of veins, as shown very clearly by Thompson. In all other members of the family the sporangia are in a single sorus on each lobe or on each vein-group, the sorus not terminal on the vein, even in *Gleichenia* proper, where a terminal position has been described by many authors (I have observed the vein continued beyond the sorus in cleared leaflets of *G. microphylla* R. Br., *G. circinnata* Sw., and *G. vulcanica* Bl.). The annulus in *Platyzoma* is shown by Thompson to be typically oblique, but irregular in position and in form ; it is always interrupted at the stalk of the sporangium. A stomium is usually present, irregular in nature and position. In these characters of the form of the sporangium, Platyzoma differs completely from other *Gleicheniaceae*.

Spores. The spores of *Platyzoma* are of two kinds, with occasional intermediates, one kind having a diameter about twice that of the other. Each sporangium contains spores of one kind ; either a maximum of 16 large spores, or of 32 smaller spores. In all other known living members of *Gleicheniaceae* the sporangia contain a very much larger number of spores (a few hundreds), and no marked dimorphism among the spores has been observed. Tutin (1932) and Miner (1934) have described fossils, ascribed to the genus *Gleicheniopsis* (from Cretaceous rocks in Greenland) in which the sporangia contain only 32 spores, but in soral form and position these fossils agree with *Gleichenia*, not *Platyzoma* ; and it should be noted that the precise structure of the sporangia of these fossils is unknown, and further that they were not actually attached to any rachises showing the characteristic branching habit of *Gleichenia*.

The genus *Jamesonia*, confined to South America, shows agreement with Platyzoma in several of the above characters. Both *Jamesonia* and *Platyzoma* are native of dry climates, and reduction of size has resulted in both

as an adaptation to climatic conditions. With reduction of size comes some simplification of structure, which always makes the understanding of relationships more difficult. But I suggest that the resemblances which are not primarily adaptations to a dry climate are sufficient to be significant. For a discussion of the morphology and anatomy of *Jamesonia*, see Thompson (1918).

Jamesonia has a creeping rhizome covered with long simple hairs, though not so densely as in *Platyzoma*. Anatomically it has a fully developed solenostele.

In addition to normal fronds, which are closely similar to those of Platyzoma in shape, the rhizome of *Jamesonia* may bear much-reduced fronds, with few scattered small pinnae, very much like the reduced fronds of *Platyzoma*, though no fronds completely devoid of pinnae have been found. In both *Jamesonia* and *Platyzoma* there is indefinite continuation of apical growth of the fronds.

The shape of the pinnae, and their mode of attachment, are closely similar in *Platyzoma* and *Jamesonia* ; and at least some species of *Jamesonia* have a fringe of hairs or papillae on their reflexed margins.

One species of *Jamesonia* (*J. ceracea* Maxon) has a waxy powder on the lower surface ; such powder is present on the lower surface of the leaf in several genera which are considered to be allied to *Jamesonia* (*Aleuritopteris*, *Pityrogramma*, *Trismeria*, *Onychium*) and is rare in other groups of ferns.

The sporangia are solitary at the apices of the veins in species of *Aleuritopteris* (construed as including *Sinopteris* C. Chr. & Ching) ; if this group of ferns originated from ancient members of the *Schizaeaceae* (as Bower and others have thought probable), this condition would be primitive, and one line of evolution among the Gymnogrammoid ferns has resulted in the production of sporangia along the veins (as in *Jamesonia*) instead of only at their ends.

The sporangia of *Jamesonia* frequently have irregularities in the shape of the annulus, very closely similar to those of *Platyzoma*, though less exaggerated. Similar irregularities in the annulus occur also in other Gymnogrammoid ferns, as indicated by Thompson (1918). I would also include *Ceratopteris* in this alliance (though the basic chromosome number differs) ; irregularities of the annulus are conspicuous in *Ceratopteris*, and the spores are also very large.

One character in which *Platyzoma* agrees with *Gleichenia* and not with *Jamesonia* is in the extra-marginal origin of the pinna-traces from the vascular tissue of the rachis (Thompson 1916, pl. II, fig. 15 ; 1918, pl. II, fig. 10). But this does not necessarily rule out a relationship between the two, as both kinds of origin of pinna-trace can occur in the same frond of *Trismeria* (Bower 1923, p. 173).

It appears to me that the above evidence warrants the exclusion of the genus *Platyzoma* from the family *Gleicheniaceae*, and its tentative reference to a place among the Gymnogrammoid ferns, as an isolated type which has retained the primitive characters of rhizome-protection by long simple hairs, single sporangia at the vein-endings and a rather primitive vas-

cular structure, and has undergone adaptation to a dry climate in the same kind of way as *Jamesonia*.

As regards the two kinds of spores, the condition described by Thompson is closely similar to that now known to exist in apogamous ferns of advanced Leptosporangiate type (Manton 1950, ch. 10), one difference being the unusually large size of the spores of *Platyzoma*. Manton found that apogamous ferns produce non-functional haploid spores in some sporangia, and in other sporangia the larger diploid spores which are the effective agents of reproduction. The number of diploid spores is half that of the haploid ones. It seems likely that *Platyzoma* is apogamous (no *Gleichenia* has yet been shown to be so), and it should not be difficult to prove whether this is in fact the case.

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Bearded Irises.*—The author of this book has rendered a service to all who take an interest in the tall bearded iris, in gathering together under one cover much useful information. Although the work is not an exhaustive treatise on the genus Iris, it deals with it as a garden plant in a most interesting manner. There are accounts of iris in the Ancient World, early days in its cultivation, iris species, the iris as it is today, followed by chapters on irises of different colours, each chapter concluding with a list of the varieties described therein. The author then goes on to deal with plicatas, variegatas, amoenas, new colours, the aim of the iris breeder, dwarf and intermediate bearded irises, and the use of the iris in the garden. The book contains 11 photographs and 6 line drawings and an adequate index. H. S. Marshall.

* The Tall Bearded Iris. By Nicholas Moore. Pp. 120, illus. London : W. H. & L. Collingridge Ltd. Price 21/-.

Agricultural Ecology.*—The application of ecology to economic problems, sometimes designated hemerecology, has obviously great possibilities of development. From many points of view, agriculture is the most important of all divisions of economic biology and its practice must of necessity include many activities that are basically ecological. It can be argued that in this country ecologists, as such, have devoted relatively little attention to hemerecology. In contrast, geneticists have utilized cultivated plants, in the sense of cultispecies and cultivars that have been selected, bred, and crossed by man for many generations, often to the exclusion of material derived immediately from wild populations. There are, of course, exceptions to such generalizations but they are true on the whole. One naturally expects much from a book with the title " Agricultural Ecology ". The work here under notice contains many interesting data, but it does not, even as a text-book, adequately cover the field indicated by its title. The author is professor of Agricultural Ecology in the University of Perugia and the publication, originally written in Italian, was translated into English by Dr. Enzo Fano. One cannot avoid commenting on the general restriction to Italian agricultural conditions and crops and, as indicated by the bibliography, to predominantly Italian researches. While it is very useful to English readers to have this summary of agricultural investigations in Italy the book is of less wide use than it would have been if the subject had been covered on a larger geographical scale.

The book is divided into four parts, with the headings : agricultural climatology, the soil-unit and the climate-soil complex, the yield and ecological characteristics of cultivated plants, and factorial combinations and differential analysis of yield. Agricultural Ecology is defined as " the study of the physical characteristics of environment of agricultural plants, and to the yield of such plants from the quantitative (amount of the product), qualitative (quality of the product) and generative (characters of the seed) points of view." Factors are classified as extrinsic (environmental) or intrinsic (of the plant). The climatic aspects of the environment are especially emphasized. Graphs and tables are given in abundance. The importance of dividing the vegetative period of a crop into sub-periods is illustrated for cereal, root, and fruit crops. Details are given for meteorological equivalents for many herbaceous and woody plants. Photo-periodism is discussed and there is an account of the influence of the moon on the development of plants. Climatic formulae, micro-climates, statistical methods, soil units, and soil series are given chapters or part chapters. The economic relevance of yield and vernalization of seed are considered and the ecological characteristics of wheat are given in some detail. A short chapter is devoted to resistance to cold and drought.

There is a useful summary of the methodology of agricultural ecology and an instructive glossary.

W. B. Turrill.

* Agricultural Ecology, by Girolams Azzi, Constable & Co. Ltd. 1956, pp. 424, 45/- net.

NOTES ON AFRICAN CELASTRACEAE. II.*

R. A. Blakelock

Work on the *Celastraceae* for the " Flora of Tropical East Africa " has necessitated the making of the nomenclatural changes proposed in this paper.

Cassine stuhlmannii (*Loes.*) *Blakelock* comb. nov.

Elaeodendendron stuhlmannii Loes. in Engl., Bot. Jahrb. **28,** 156 (1900).

E. bussei Loes. l.c. **41,** 309 (1908).

Leaves opposite, subopposite or alternate on the same plant, coriaceous, glaucous when dry, nerves very prominent and reticulate above, less so below, margin spiny-serrate, rarely serrate, subentire or entire. Inflorescence a dense subcapitate cyme (all flowers touching each other). Petals (of males) 2·5–4·5 mm. long, or (of females) 2·5 mm. long. Fruit ellipsoid or subglobose, apex rounded, 1·4–2 cm. long.

Kenya. K4, Motomo Hill, 3000 ft., 20.1.1942, *Bally* 1581 ; K7, between Samburu and Mackinnon Road, c. 350 m., 31.8.1953, *Drummond and Hemsley* 4076 ; K7, Makadara, Shimba Hills, 1000 ft., July 1939, *C. van Someren* 103 (EA) ; Mbololo Hill, 4500 ft., Sept.–Oct. 1938, *Joanna* 8917 (EA).

Tanganyika. T1, Shinyanga, *Koritschoner* 1715 (K, EA) ; T1, Shinyanga, 4000 ft., 11.3.1937, *B. D. Burtt* 5567 (K, EA) ; T1, Bweri, Musoma, Apr. 1948, *G. Watkins* 2313 ; T3, Handeni sub-district, Feb. 1920, *C. F. M. Swynnerton* (BM) ; T3, Umbasteppe, 100 m., 1934–5, *Bally* 120 (EA, K) ; T3, Handeni Distr., Madebe, July 1950, *Semsei* 588 (EA) ; T4, 5 miles from Igombe, 3500–4000 ft., June 1935, *H. A. Lindeman* 147 (BM) ; T5, Kondoa Distr., Bubu Valley, 4300 ft., 12.12.1927, *B. D. Burtt* 819 (K, BM) ; T5, Mpwapwa, 3500 ft., 21.10.1928, *H. E. Hornby* 43, 44, H13/32 (K, EA) ; T5, Mkalama Distr., summit of Iramba Scarp, above Sekenke, 25.7.1931, *B. D. Burtt* 3372 (K, EA) ; T5, Mpwapwa, 3500 ft., 18 and 26.8.1930, *Greenway* 2338, 2467 (K, EA) ; T5, Singida, 25.2.1948, *Police* H22/48 (EA) ; T5, Dodoma–Arusha road, 1.10.1951, *J. F. Hughes* 122 ; T6, Bagamoyo, Feb. 1871, *Kirk* ; T6, Morogoro, 1600 ft., 30.11.1932, *G. B. Wallace* 508 ; T8, Lindi, 5.5.1903, *Busse* 2412 (EA, isotype of *Elaeodendron bussei* Loes.) ; T8, Lindi, 100 km. N.W. Lindi, Tendaguru, 200 m., 20.2.1935, *H. J. Schlieben* (BM).

Portuguese East Africa. Zambezi Valley, 30 miles above Tete, 320 m., 12.6.1947, *R. M. Hornby* 2745.

S. Rhodesia. Zambezi Valley near Chicoa, 12.6.1947, *R. M. Hornby* 17440 ; Sabi-Lundi Junction, Donga-Chitsa's Kraal, 800 ft., 6.6.1950, *Chase* 29142 ; Umtali, Inyamashira Mts., 5000 ft., 9.9.1951, *Chase* 34532.

The syntypes of *Elaeodendron stuhlmannii* Loes. are : T6, Usaramo, Kidenge, Jan., *Stuhlmann* 6326 and N'honge, N.W. Uzaramo, Dengua, Oct., *Stuhlmann* 8652. Neither of these have been seen, but there seems little doubt from the description that they are the same species as the specimens cited above.

Drummond and Hemsley 4076 shows entire and subentire leaves on the same shoot. The fruits, however, are large and rounded and the leaf-nerves are more prominent on the upper than on the lower surface, so that this specimen is included here and not in *C. schweinfurthiana* Loes. *Van Someren* 103 shows entire leaves as well as leaves with a few distant spines and the leaves are large (up to 9·3 cm. long, 7·3 cm. wide) so that, as there are no flowers nor fruit, it is only doubtfully included in *C. stuhlmannii*.

The collector's notes give some ecological information. The species is fairly common (locally) to rare, occurring in *Combretum-Acacia* formation,

* Continued from Kew Bull. 1956, 237–247 (1956).

riverine forest and on the margin of saline steppe among *Euclea* and *Carissa*. It grows on dark brown soil on the edge of a *donga*, on a poor red stony soil as well as on heavy loamy and clay soil. It occurs from sea-level to 1350 m.

It may be pointed out that Davison (in Bothalia **2,** 326–336 : 1927) does not maintain *Elaeodendron* as a distinct genus from *Cassine*, so far as all the South African species are concerned. The characters used to separate *Cassine* L. and *Elaeodendron* Jacq. f. do not appear to hold. Loesener (in E. and P., Pflanzenfam. **20B,** 110 : 1942) regarded scalariform perforations in the vessels as confined to *Elaeodendron* and simple perforations as being found in *Cassine*. The vessel perforations are exclusively simple in *Cassine capensis* L., but exclusively scalariform in *C. crocea* (Thunb.) O. Kze. (Metcalfe and Chalk, Anat. of the Dicots. **1,** 393 : 1950). The other characters are equally insufficient ; opposite and alternate leaves, a thin or a thick fleshy mesocarp may be found in one species (e.g. *Cassine schweinfurthiana* Loes.).

Hippocratea indica *Willd.* var. **parviflora** (*N. E. Brown*) *Blakelock* stat. nov.

Hippocratea parviflora N. E. Brown in Kew Bull. 1909, 99 (1909).

H. hirtiuscula Dunkley in Kew Bull. 1934, 185 (1934).

Twigs 4-lineate or subtetragonous, pubescent. Leaves usually slightly pubescent on both surfaces especially on nerves and midrib. Inflorescence a loose ± divaricate cyme. Sepals pubescent, up to 0·5 mm. long. Petals glabrous or very sparsely pubescent outside, 1–3 mm. long.

(China. Yunnan, Red River, *A. Henry* 9612.)?

Tanganyika. T1, Shinyanga, *Koritschoner* 1922 (EA, K) ; T4, Tabora, *H. A. Lindeman* 604 (EA, K) ; T5, Kondoa District, Kinyassi, 4700 ft., 2.1.1928, *B. D. Burtt* 915 ; T5, E. Kondoa, 20.2.1928, *Thompson comm. B. D. Burtt* 1458 (EA, K, BM) ; T5, Singida, 18.12.1928, *A. P. G. Michelmore* 843 (EA, K) ; T6, S. and W. Mwapwa, 9.2.1921, *H. E. Hornby* 431 (EA, K).

Bechuanaland. Kwebe Hills, 3,300 ft., 16.2.1898, *Mrs. E. J. Lugard* 180 (holotype of *H. parviflora* N. E. Brown).

N. Rhodesia. Bombwe Forest, 9.11.1932, *J. D. Martin* 354 (isotype of *H. hirtiuscula*) ; Barotse Prov., Sesheke Distr., S. of Namena Forest, 11 miles from Machili on the Old Mwandi road, 21.12.1952, *Angus* 989 ; Sichinga Forest Reserve near Sesheke, 29.12. 1952, *Angus* 1072 ; Southern Prov., Livingstone Distr., Bombwe Forest, 3.1.1953, *Angus* 1100 ; Southern Prov., Mazabuka Distr., Pemba Forest Reserve, 3 miles south of Pemba, 17.1.1954, *F. White* 1940.

Var. *parviflora* differs from var. *indica* in being pubescent. It could be regarded as a subspecies confined to Africa but for the existence of a specimen from China (*Henry* 9612) which is pubescent on the young twigs, inflorescence branches and the outer surface of the sepals although the leaves are glabrous or glabrescent. This specimen is doubtfully included in var. *parviflora*. Possibly var. *parviflora* is a mutant which occurs here and there throughout the area of the species, but it must be pointed out that all the other Asiatic material of *H. indica* seen belongs to var. *indica*. The species is widespread in Tropical Asia as well as in Tropical Africa.

H. indica var. *parviflora* is easily confused with *H. buchananii* Loes., a native of Tanganyika (T5, 6, 8), Portuguese East Africa, Nyasaland

and N. and S. Rhodesia. These two taxa may be identified from the following key :—

Twigs 4-lineate or subtetragonous, pubescent ; inflorescence a divaricate cyme ; sepals much shorter than petals ; petals glabrous or very sparsely pubescent on outer surface . . *H. indica* var. *parviflora*

Twigs subterete rarely 4-lineate, tomentose ; inflorescence a cyme with a central axis (continuation of peduncle); sepals $\frac{3}{4}$ the length of, as long as, or longer than the petals ; petals tomentose on outer surface *H. buchananii*

Flora of the Sudan, Vol. III.*—Dr. Andrews, through perseverance and courage in the face of serious illness, has brought out the third and concluding volume of this important work. This, then, is the final fruit of fifteen years of preparation for this task, and Dr. Andrews may justifiably indulge in a feeling of triumph in looking back upon its completion. Not many areas of Africa may boast of a completed and up-to-date flora, and Dr. Andrews has placed the Sudan in his debt by producing one.

The third volume contains the families, 52 in all, from *Compositae* to *Gramineae*, arranged according to Hutchinson's system ; a total of 505 genera and 1,172 species are described. All the monocotyledons are included, the grasses being the largest family in the book with 120 genera occupying almost 186 pages ; the *Compositae* with 79 genera take, however, only 63 pages. A considerable number of new combinations and a sprinkling of new names are scattered through the book, all of them attributed to Mr. J. E. Dandy, to whose great help tribute is paid by Dr. Andrews in his preface. One very well-known plant, the Sausage Tree, loses its familiar Latin name, *Kigelia aethiopica*, to re-appear slightly disguised and less euphoniously as *Kigelia aethiopum*. The careful and accurate nomenclature throughout, embodying doubtless an immense amount of research by Mr. Dandy, makes this a book to be very often consulted by botanists dealing with African plants.

The format and arrangement of this volume are exactly the same as in the previous two, of which various criticisms have been made in the reviews, which need not be repeated here.

The six years that have elapsed since the publication of the first volume have seen the achievement of independence by the Sudan. In 1952 the flowering plants of the Anglo-Egyptian Sudan were described ; in 1956 they inhabit the Sudan : history has altered the title of the book. The Sudanese will in the years to come find that Dr. Andrews has given them a reliable guide to the diversity of plants growing in their land, and will, I hope, both use it and be thankful.

J. P. M. Brenan.

* The Flowering Plants of the Sudan, Vol. 3. By Dr. F. W. Andrews. Buncle & Co. Ltd., Arbroath, Scotland. 1956. Price 21/-. Vol. 1 was reviewed in Kew Bulletin, 1951, pp. 40–41 ; vol. 2 in Kew Bulletin, 1952, p. 538 (1953).

The History of the British Flora.*—The British flora is poor in species as compared with that of many other areas of comparable size, even in the temperate regions. Moreover, the native status of many of its present constituent species is uncertain. Nevertheless, the geographical situation of the British Isles off the north-west of Europe, within the zone of oceanic climate, combined with its varied geology and diversified soils, gives the flora a high degree of phytogeographical importance. Detailed studies in autecology, in cytogenetics, in range mapping, and in variation are resulting in the accumlation of data essential to a full synthetic taxonomy of the British flora. The history of a flora can only be tentatively surmised unless a good deal is known about its fossil record. While remains in peat bogs and other deposits can yield most important evidence this needs correlating with equally valid, and sometimes more complete, information from other lines of research. The work on Quaternary plant remains, initiated in a modern sense by Mr. and Mrs. Clement Reid and Miss Chandler, and extended back into Tertiary strata by Mrs. Reid and Miss Chandler, has been greatly extended by examination and recording of pollen grains, especially from peat bogs, in many parts of the British Isles. In doing this Dr. H. Godwin has been a leader and to him and his associates we owe a great many detailed publications which have appeared in various journals. To have all the results of researches on Quaternary plant fossils in the British Isles summarized systematically with full references to original publications has been a need for some time and this need is now adequately met in the finely produced volume with which this notice is concerned.

Essentially, Dr. Godwin deals with his subject in three main parts. First, there is an introductory account of the collection and determination of plant remains and of the background scale of Quaternary change followed by a list of recorded sites. Secondly, the major part of the book, a systematic record of the plant remains as determined species by species. Thirdly, a careful discussion of the " pattern of change in the British flora ", and a final chapter headed " Conclusion ". The book is well illustrated by photographic plates and by black and white text figures. There is a long bibliography and an adequate index. The introductory and, even more, the final part are extremely readable but cannot be discussed adequately in a short notice. Table I has, in the copy before the writer been shifted from " opposite p. 12 " (as recorded on p. 9) to the end of the book. One would like to know where *Silene maritima* occurs on salt-marshes (p. 321). The nomenclature is as up-to-date as can reasonably be expected.

The author and the publishers are to be congratulated on the publication of this valuable addition to botanical literature.

W. B. Turrill.

* H. Godwin : The history of the British Flora, a factual basis for phytogeography, Cambridge University Press, 1956, pp. 384, plates 26, figures 117, 90/-.

RESEARCHES ON SILENE MARITIMA AND S. VULGARIS XXXIV.

The Anatomy of Stems and Leaves of the Bladder Campions.

ROSEMARIE HUNGERBÜHLER

The series of papers published in the Kew Bulletin on *Silene maritima* and *S. vulgaris* has included many references to vegetative characters, especially those of external morphology. The anatomy of the root systems in the two species has been dealt with by M. E. Millner. In the present paper an account is given of the internal structure of the stem and leaf as based on material provided by Mr. E. M. Marsden-Jones and Dr. W. B. Turrill. Details regarding the origins of the specimens studied are :

S. vulgaris :	No. 1.	Wiltshire, Etchilhampton.
	No. 2.	Wiltshire, from wild material now cultivated at Littleton Panell (densely hairy).
	No. 3.	Wiltshire, from wild material now cultivated at Littleton Panell.
S. maritima :	No. 4.	Cornwall, near Sennen Cove.
	No. 5.	Cornwall, ½ mile from Sennen Cove towards Land's End.
	No. 6.	Cult. Kew from seed from France, Brittany, Pte de Grouin.
	No. 7.	Cult. in Herbaceous Department, Kew.
	No. 8.	Dorset, Chesil Beach, Portland end (narrow leaved).
Hybrid	No. 9.	Natural hybrid growing now at Dauntsey, Wiltshire.

My thanks are due to Mr. G. Atkinson for instructions in preparation of the text figures, to Dr. C. R. Metcalfe for assistance in the methods used and for providing facilities in the Jodrell Laboratory, and to Dr. W. B. Turrill for help in the research and in preparation of this paper.

Stems.

Silene vulgaris (No. 1). fig. 1 to 4.

The *epidermis* consists of elongated narrow cells, with their long axes parallel to the long axis of the stem and without chlorophyll. Their outer walls are slightly thickened and are covered by a thin cuticle. Between the epidermal cells there are scattered stomata.

The cells of the *cortex* are roundish or cylindrical. In the internodes they are arranged in about four layers. The greater thickness of the stems in the nodes is mainly due to an increased number of layers in the cortex, the layers being parallel to the surface and the extra layers on the side towards the centre of the stem.

Within the cortex there is a cylinder of *sclerenchyma*. In the internodes the thickness of cortex and sclerenchyma is about the same. The cells of the latter are long and have thick, lignified walls with pits. The cells

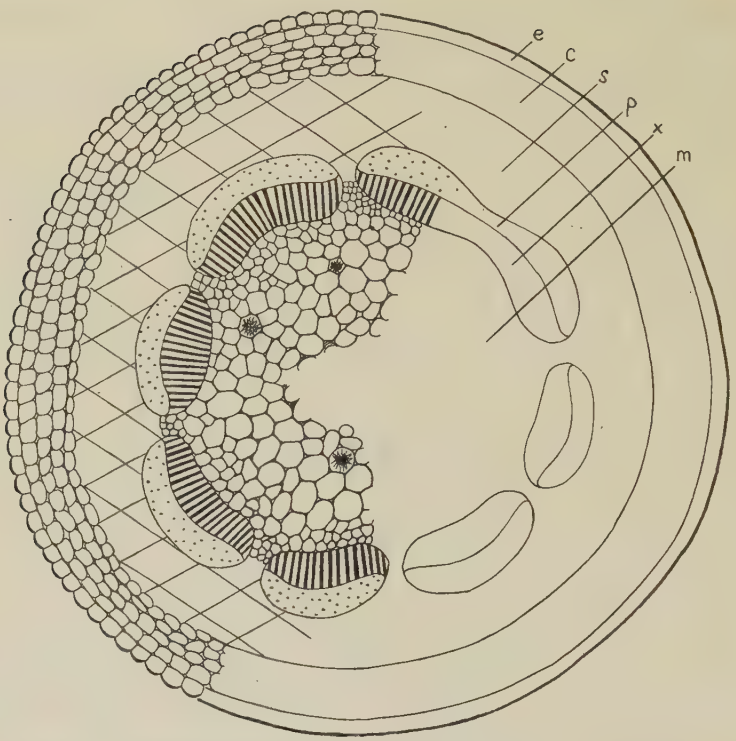

FIG. 1. *S. vulgaris* (No. 1). Transverse section through an internode.

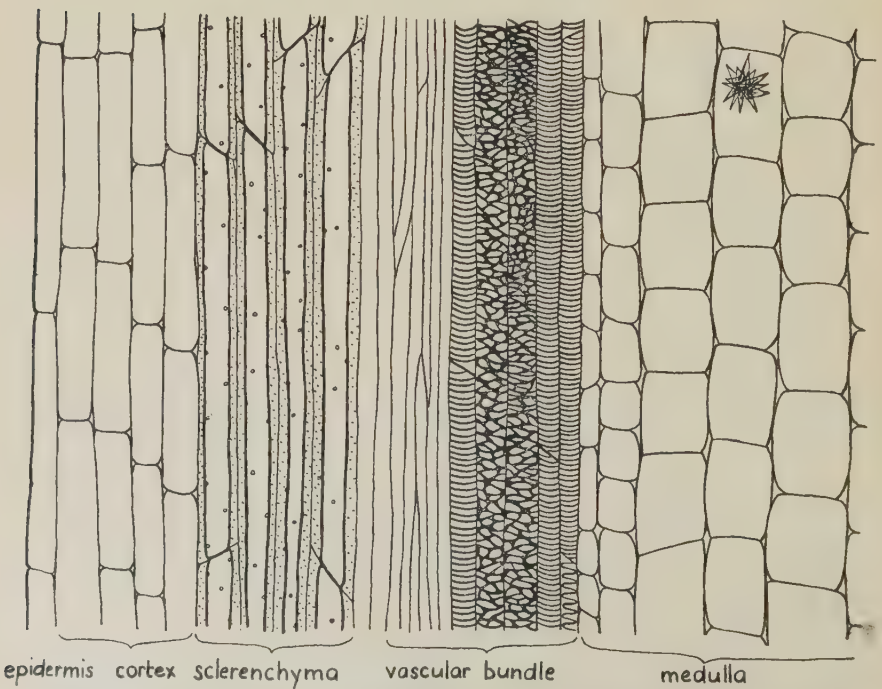

FIG. 2. *S. vulgaris* (No. 1). Longitudinal section through portion of an internode.

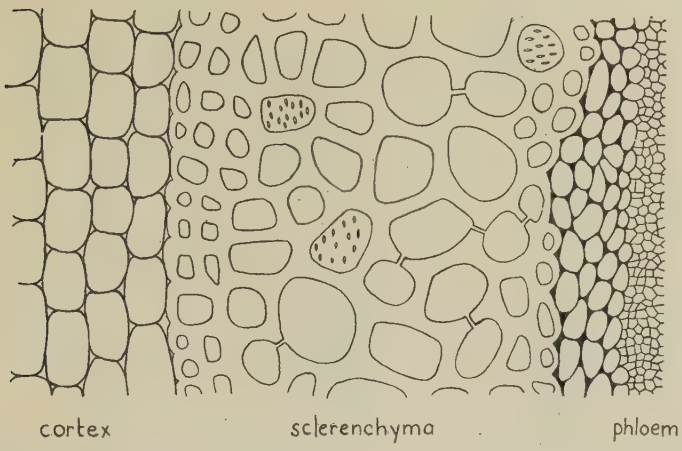

FIG. 3. *S. vulgaris* (No. 1). Details of internode anatomy (transverse section).

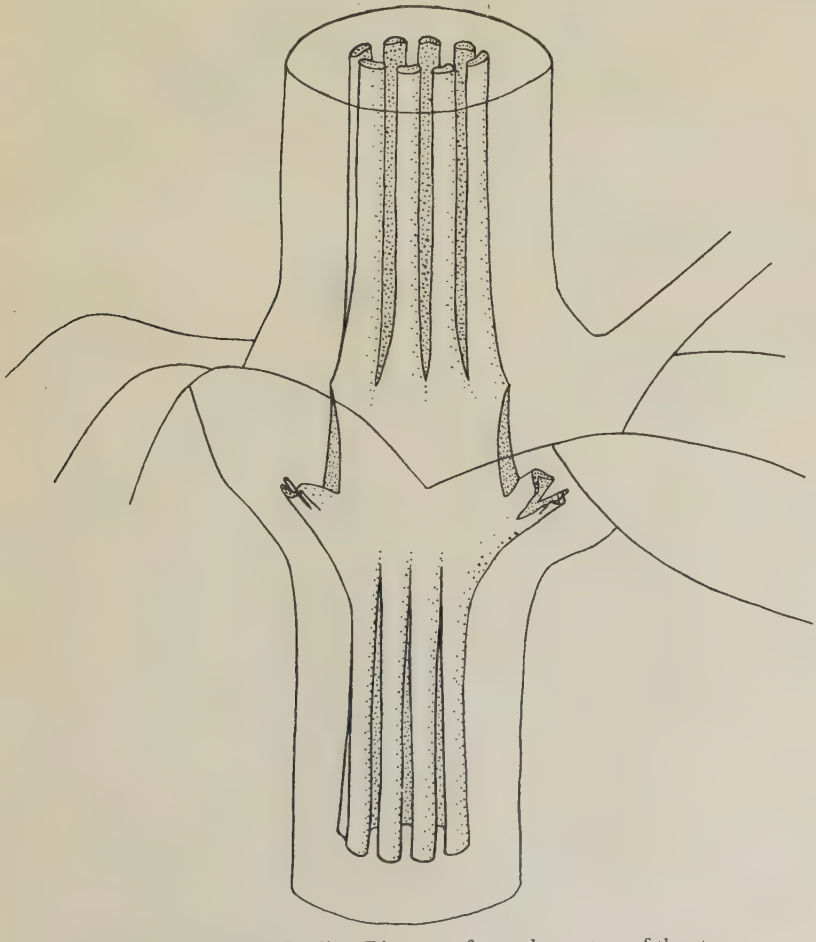

FIG. 4. *S. vulgaris* (No. 1). Diagram of vascular system of the stem.

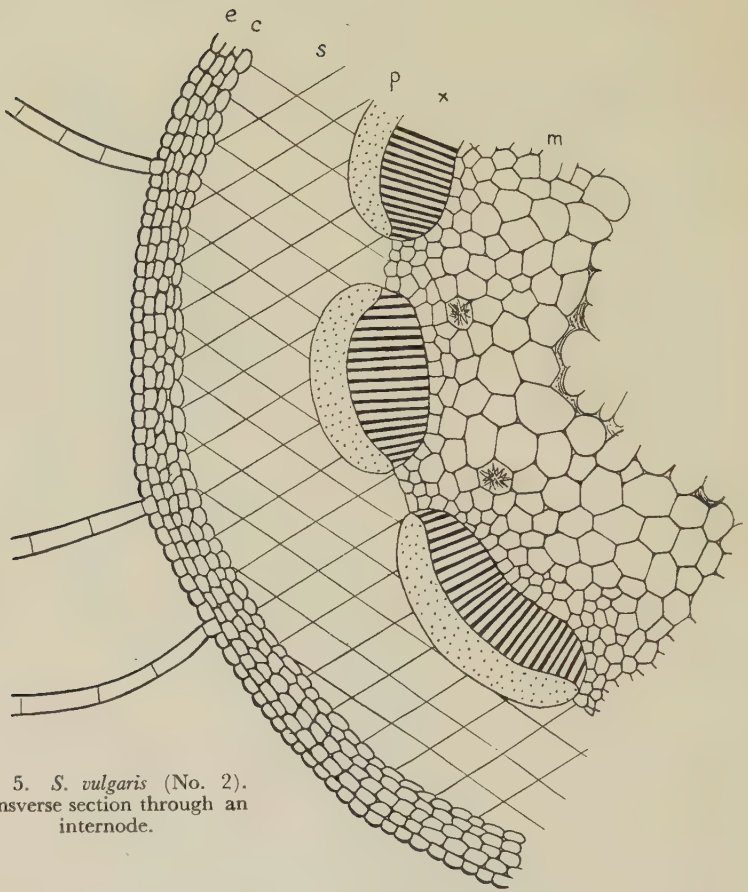

FIG. 5. *S. vulgaris* (No. 2). Transverse section through an internode.

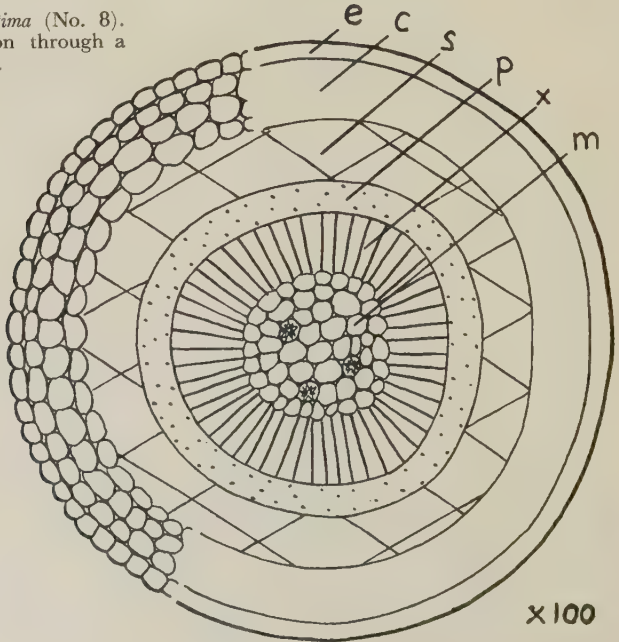

FIG. 6. *S. maritima* (No. 8). Transverse section through a node.

are arranged in four to eight layers ; those with the widest lumen lie in the middle of the cylinder, and towards the centre as well as towards the periphery of the stem there are narrower ones (fig. 3) ; the diameter of these and those of the cortex cells is about the same.

The *vascular system* (fig. 4) is separated from the sclerenchyma only by a few layers of narrow collenchymatous cells. The transverse section of the vascular system appears very different at different levels of the stem. In some of the sections we see completely separated bundles (often four or eight), while in others there is a solid ring of bundles (compare fig. 1, 5, 6, 7, 8). In the internodes there are several vascular bundles separated by parenchyma. Underneath the nodes these join together and form, over a short distance, a solid tube. Related to the position of the leaves and axillary branches there are two tube-like opposite outgrowths in a node. Over each of these outgrowths there is one gap in the vascular tube of the stem. Sinnot states that this feature, which he calls unilacunar, is characteristic of the *Centrospermae*. Mostly these gaps are closed higher up, and as the node passes into the internode the vascular tube is split into several separate bundles again. Not only do the sections through nodes and internodes look different ; there are, too, certain differences in the internodes of the same plant. In the lower parts of the stems, where the internodes are short, the vascular system generally is not split into separate bundles, whereas in the long internodes beneath the inflorescences there are mostly eight well separated bundles.

Each of the two outgrowths of the vascular system in the nodes forms an upper and a lower half cylinder ; the lower one provides the leaf and two lateral bundles are separated near the base. The upper half cylinder forms a short cone if there be no secondary axis but if there be one, the half cylinder gives rise to the complete vascular system of the secondary axis which is like that of the primary one.

The *medulla* consists of mostly big cylindrical cells. Some of these contain cluster crystals, especially in the nodes. It is hollow for most of the internode length, the hollow portion being widest about the middle of the internode, while the nodes are mostly solid.

Silene vulgaris (Nos. 2 and 3) fig. 5.

The stems of these plants are thicker than those of the Wiltshire specimens. The features of the *epidermis* are the same except that there are multicellular unbranched hairs in the No. 2 specimens. The *cortex* consists of about four layers of cells in the internodes in all the specimens examined, but there are certain variations in the thickness of the *sclerenchyma*. Especially in the No. 2 specimen the sclerenchyma is very thick, i.e. two or three times as thick as the cortex ; small cells (about the diameter of the cortex cells) form the outer part, but towards the centre the cells are two or three times larger. The features of the *vascular system* and of the *medulla* are the same in all the specimens studied.

Silene maritima (Nos. 4, 5, and 8) fig. 6.

In comparison with the stems of *Silene vulgaris*, those of *S. maritima* are, as a rule, of smaller diameter, the internodes are shorter and the nodes relatively less increased in thickness. But the general anatomical features are the same.

The *epidermis* consists of cells without chlorophyll, with slightly thickened outer walls ; there are, too, scattered stomata. The *cortex* is three or four layers thick, the cells are roundish or cylindrical like those in *S. vulgaris*. In comparison with that species the *sclerenchyma* is not so well developed ; there are generally only three or four layers of cells, and the walls are less thickened. The features of the *vascular system* are the same, but since the internodes are mostly shorter in *S. maritima* the vascular system often forms a more or less continuous tube without being split into separate bundles. The *medulla* is similar in the two species ; in *S. maritima* there occur cluster crystals too, especially in the nodes where there is no medullary hollow.

A special observation was made on the narrow leaved specimen. Here, at the base of the plant, the walls of the epidermal cells, of the cells between the sclerenchyma and the vascular system, and of some of the cortex cells are stained dark brown, probably from a deposit of phlobaphene.

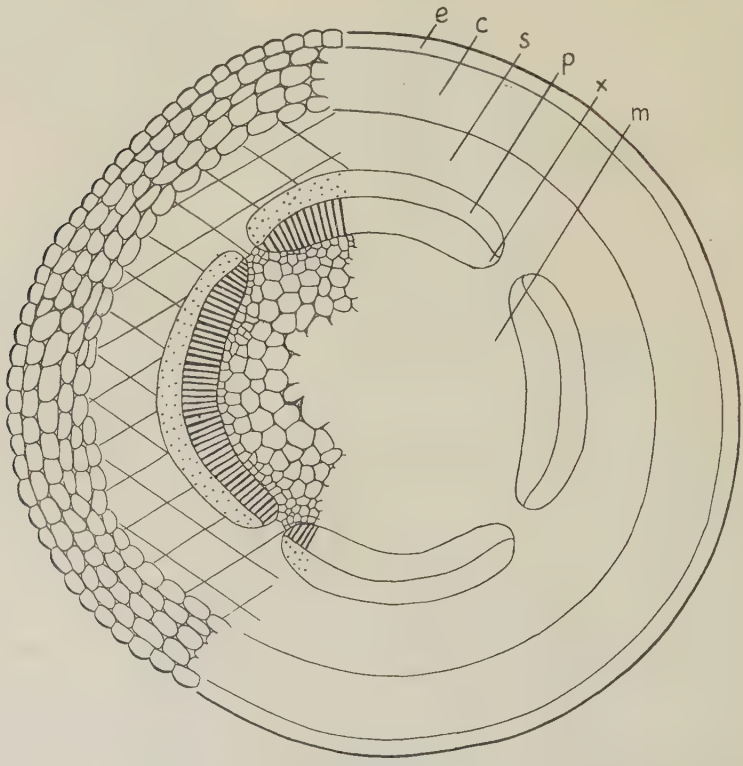

Fig. 7. *S. maritima* (No. 7). Transverse section through an internode.

Silene martima (Nos. 6 and 7) fig. 7.

The stems are definitely thicker than those of the wild grown specimens. All the cells are slightly larger. The cortex consists of about the same number of layers, but the sclerenchyma is better developed (five to seven layers). It is at least as thick as the cortex, but often about twice as thick.

Silene maritima × *vulgaris* (No. 9) fig. 8.

The stems are thicker than those of the wild grown *S. maritima* specimens, but thinner than most of those of *S. vulgaris*. The sclerenchyma has about the thickness of the cortex or is slightly thicker than this.

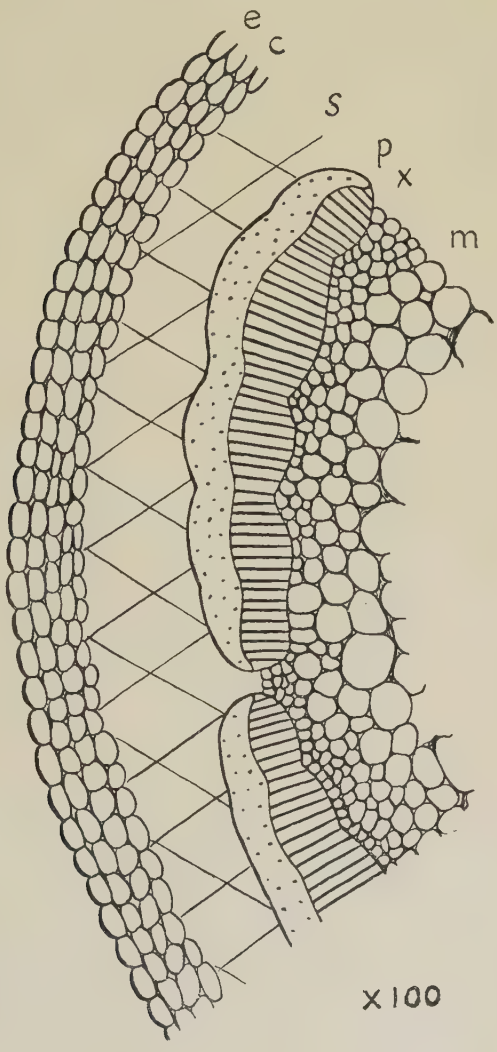

Fig. 8. Hybrid (No. 9). Transverse section through an internode.

Leaves.

All the descriptions and drawings refer to middle portions of well developed leaves from about the middle of the stems.

Silene vulgaris (No. 1) fig. 9, 17.

As the leaves are broad and rather thin (c. 300μ), the transverse sections look like ribbons. On the lower surface the midrib is well marked, not only by increased thickness of the leaf but also by thick walled epidermal cells.

The *upper epidermis* consists of more or less irregularly shaped cells. They are generally broader than long (in relation to the midrib), and chlorophyll is mostly lacking. All the side walls are wavy (fig. 9), the outer walls are slightly thickened and covered with a thin cuticle. Between the normal epidermal cells there are *stomata* in great numbers. Their arrangement is mostly of the characteristic caryophyllaceous or diacytic type (Metcalfe) ; i.e. they lie between two subsidiary cells whose common walls are in a right angle to the axis of the stoma. The greater part of the guard cells is surrounded by the cell nearer to the base of the leaf.

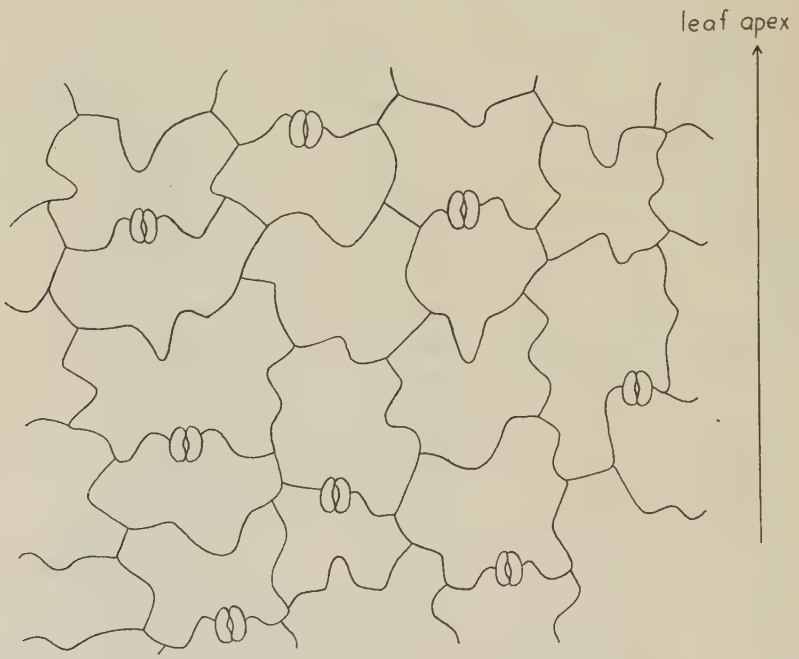

Fig. 9. *S. vulgaris* (No. 1). Leaf epidermis with stomata.

The number of the stomata is about 32 per square mm. The axes of all the stomata are parallel to the midrib of the leaf. The guard cells are smaller than the ordinary epidermal cells, but their outer walls are at the same level as these. The cuticle is much thickened over the guard cells. Remarkable is the fact that, as seen in a transverse section, the two guard cells are not exactly symmetrical, but the asymmetries of their inner walls fit tightly together (fig. 19). This peculiarity may have a controlling influence on the loss of humidity.

The *mesophyll* is formed by a palisade and a spongy tissue. In the middle of the leaf there are one or two layers of palisades, the cells being three or four times higher than wide. Intercellular spaces are well developed only beneath the stomata. The spongy tissue forms slightly more than the lower half of the mesophyll and consists of roundish cells of about the same diameter as the palisades. The cells of the lowest layer are not rarely palisade-like, i.e. nearly twice as high as wide. As usual the intercellular system is better developed in the spongy tissue than in the palisade tissue.

The features of the *lower epidermis* do not differ from those of the upper one. The shape of the cells is the same, and so are the arrangement and the relative number of the stomata.

Many *vascular bundles* occur in the leaf. Every one is surrounded by a sheath of cylindrical cells without chlorophyll.

A very striking feature of the transverse sections are the numerous *cluster crystals* which are found mostly in the middle near the boundary of the spongy with the palisade mesophyll, about on the same level as the vascular bundles (compare fig. 11). The crystals as well as the cells in which they are contained vary considerably in size.

The leaves of the lower and middle portion of the stems show characteristic features in their *margins*. There is generally one row of clear cells without chlorophyll along the margins, and there are many pluricellular roundish outgrowths as well (fig. 17).

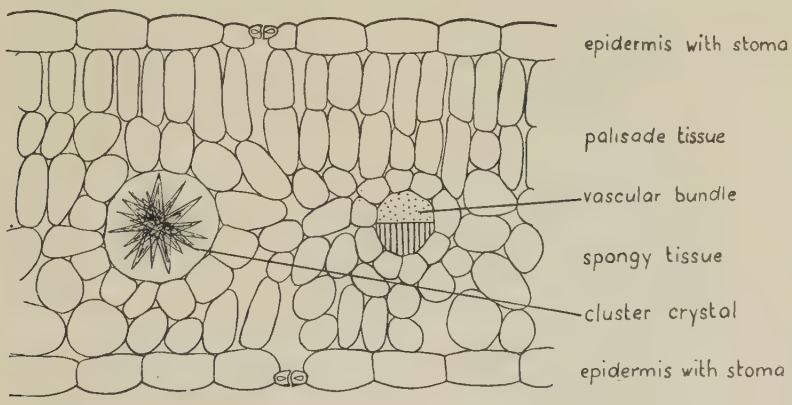

FIG. 10. *S. vulgaris* (No. 2). Portion of transverse section of leaf.

Silene vulgaris (No. 3).

These specimens show in their anatomy an almost complete similarity to the Wiltshire No. 1 specimens. The thickness of the leaf, too, is about the same (300μ). Only the epidermal cells have a different shape ; they are, as seen from above, polygonal (compare fig. 15 of *S. maritima* No. 4), with more or less straight side-walls. The arrangement of the stomata, characteristic for the *Caryophyllaceae*, is the same. In comparison with the Wiltshire specimen this specimen has more stomata (64 per square mm.), but since all the epidermal cells are somewhat smaller, the Stomatal Index* of the two specimens is about the same. The leaf margins show the outgrowths described for the Wiltshire specimen, but they are often wider.

Silene vulgaris (No. 2) fig. 10 and 17.

The internal anatomy of the specimen with dense indumentum is almost identical with that described above. The most striking feature is the covering of long unbranched but multicellular hairs on both

* Salisbury designates as Stomatal Index a relation between the frequency of stomata and the frequency of epidermal cells in the same unit area ; he uses the expression in connection with the water relations of plants.

surfaces of the leaf. On the leaf margin there are multicellular outgrowths ending in a hair (fig. 17). At the same time the relative number of stomata is remarkably high (112 per square mm.) and perhaps the covering of hairs forms a more or less closed air space preventing undue loss of moisture.

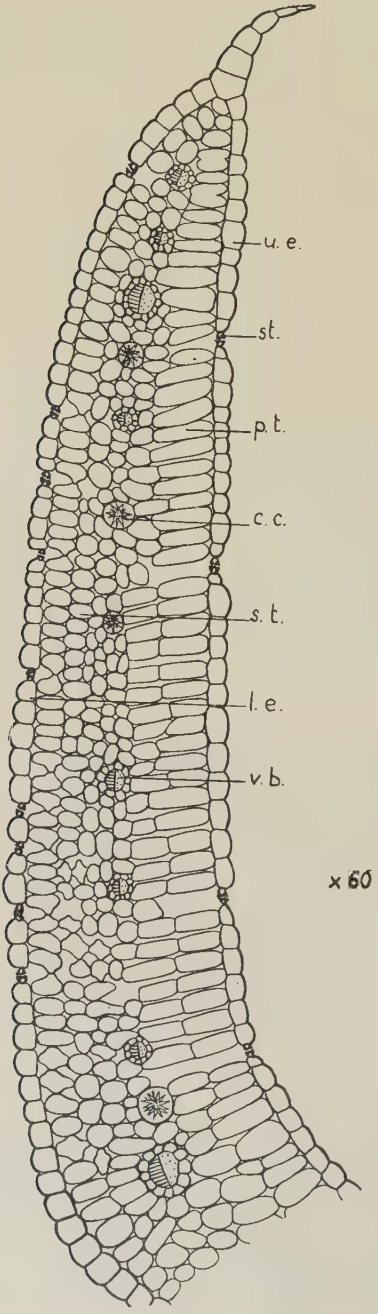

FIG. 11. *S. maritima* (No. 4). Transverse section of half of leaf × 60.

Silene maritima.

The leaves of this species are smaller than those of *S. vulgaris*, but are mostly thicker in texture (thickness being about 300 to 600μ). The anatomy of the two species is, however, very similar.

Silene maritima (Nos. 4, 5, and 8) fig. 11, 12, 15, 16, 18, 19.

The leaves are often slightly folded upwards along the midrib. A transverse section thus shows the outline form of a widely open V or of a crescent, the lowest part (the midrib) being the thickest and the two wings decreasing gradually in thickness towards the margins.

The *upper epidermis* consists of cells which are polygonal as seen from above. There is no chlorophyll in them. The outer walls are slightly thickened and covered by a thin cuticle. Between the ordinary epidermal cells there is a large number of stomata (about 160 per square mm.) arranged in the same characteristic manner as in *S. vulgaris*. The side walls facing each other are also asymmetrical but fit like pieces of a jigsaw puzzle. As a remarkable difference from the *S. vulgaris* specimens studied, the guard cells of these three specimens are slightly sunken below the general surface of the epidermal cells (fig. 19).

The *palisade tissue* forms nearly but not quite the upper half of the mesophyll. Near the midrib there are two layers of cells. The highest ones are not more than three times higher than wide. Between the midrib and the margin there is only one layer of palisade cells, the height of which decreases gradually towards the margin. These short palisade cells are mixed with arm-palisade cells. A most interesting feature is the position of the palisades : their axis is not in a right angle to the leaf surface but rather in the same direction as the light that falls on the folded leaf.

The *spongy tissue* consists of roundish cells which are partially separated mostly by small intercellular spaces. The cells of the lowest layer are palisade-like but never more than twice as high as wide. The *lower epidermis* is not different from the upper one. Even the relative number of the stomata is about the same. The *vascular bundles* have a sheath of cylindrical cells. In all three specimens there is a large number of *cluster crystals* mostly near the middle of the transverse section, at the line between the palisade and spongy tissues.

The three specimens show a certain difference in their leaf margins. *S. maritima* (No. 4) has more or less cone-shaped pluricellular teeth whose cell walls are not considerably thicker than those of the epidermal cells ; those of the narrow leaved specimen are very similar, only smaller, whereas *S. maritima* (No. 5) has only small, one or two celled outgrowths with very thick walls (fig. 18).

Silene maritima (Nos. 6 and 7) fig. 13.

The leaves of these specimens are definitely larger than those of the wild specimens. The anatomical differences between these specimens and those described are mainly the position of the palisade and the position and the relative number of the stomata. The palisade cells of the cultivated specimens are mostly at a right angle to the leaf surface, the stomata are less frequent (about 80 per square mm.), and the guard cells

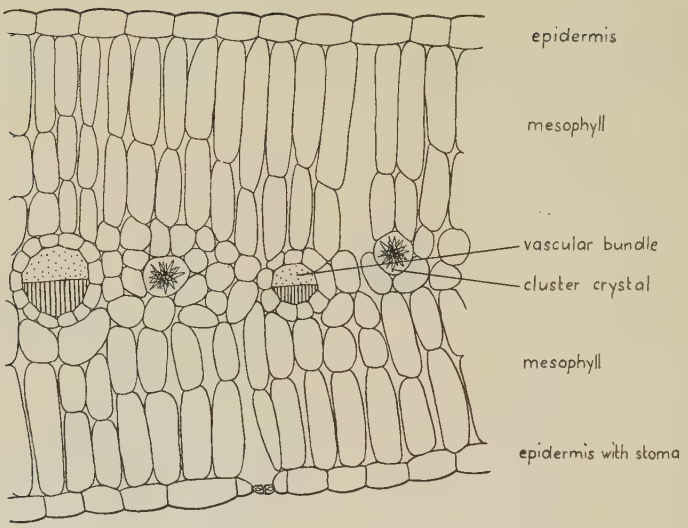

FIG. 12. *S. maritima* (No. 8). Transverse section of portion of leaf.

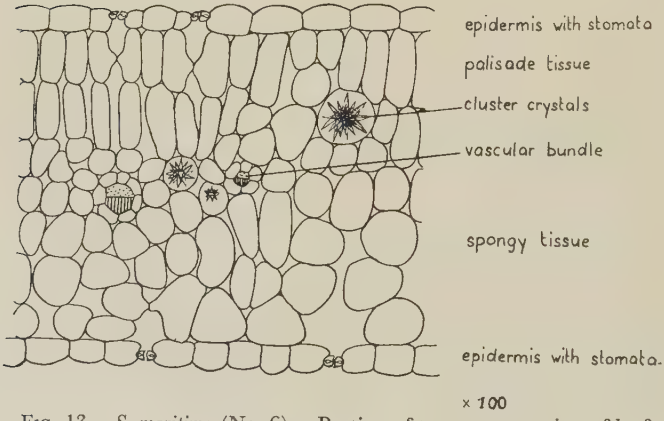

FIG. 13. *S. maritima* (No. 6). Portion of transverse section of leaf.

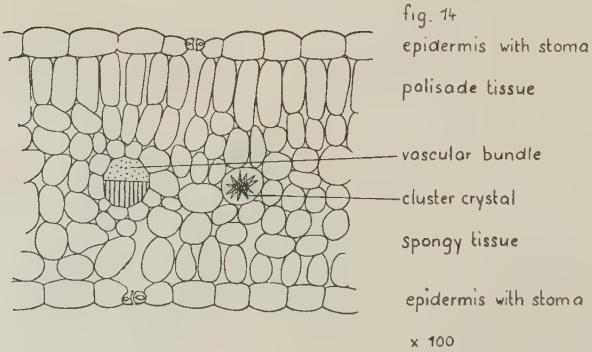

FIG. 14. Hybrid (No. 9). Portion of transverse section of leaf.

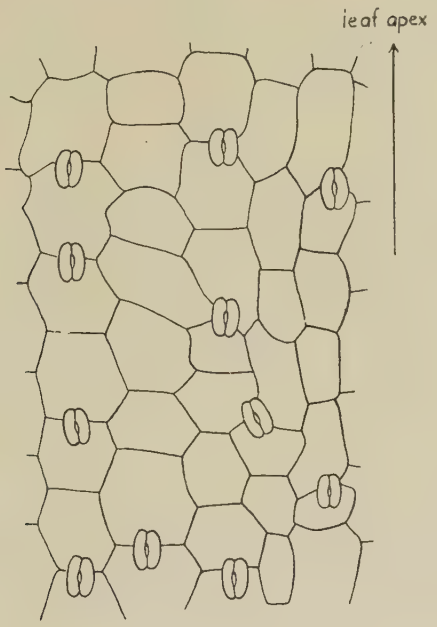

FIG. 15. *S. maritima* (No. 4). Leaf epidermis with stomata.

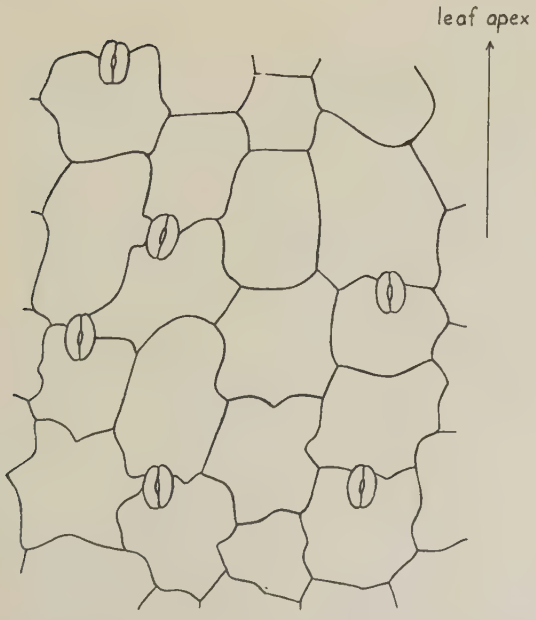

FIG. 16. *S. maritima* (No. 8). Leaf epidermis with stomata.

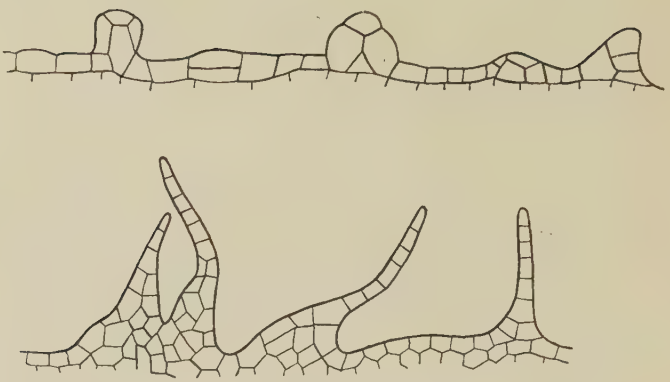

FIG. 17. *S. vulgaris* (No. 1, upper ; No. 2, lower). Leaf margins.

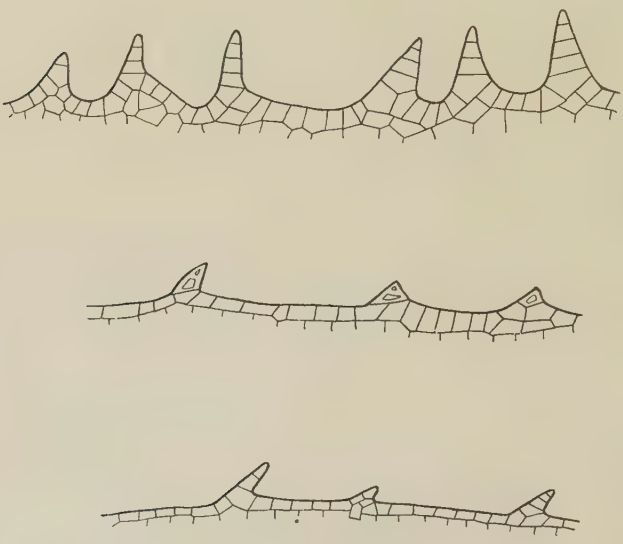

FIG. 18. *S. maritima* (No. 4, uppermost ; No. 5, middle ; No. 8 lowermost). Leaf margins.

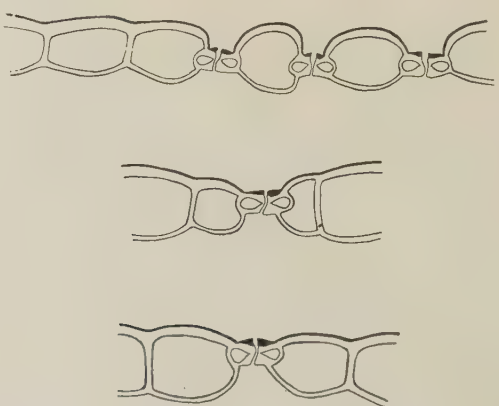

FIG. 19. *S. maritima* (No. 4, uppermost ; No. 8, middle) ; *S. vulgaris* (No. 1, etc. lowermost). Epidermis and stomata in transverse section.

are not sunken below the epidermal surface. The leaf margins are of the type of the Cornwall and the narrow leaved specimens.

Silene maritima × *vulgaris* (No. 9) fig. 14.

The leaf shape is almost intermediate between that found in *S. maritima* and *S. vulgaris*. The texture is rather thin (300μ). The anatomical features are the same as in the specimens already described (mesophyll differentiated into palisades and spongy tissue ; cluster crystals ; stomata in the general level of the epidermis). On the leaf margin there are large roundish multicellular outgrowths.

Literature.

METCALFE, C. R. and CHALK, L. : Anatomy of the Dicotyledons. Oxford 1950.

MILLNER, M. E. : Anatomy of *Silene vulgaris* and *Silene maritima* as related to ecological and genetical problems. I. The root. New Phytologist **33** : 77–95 (1934).

SALISBURY, E. J. : The Interrelations of Soil, Climate and Organism, and the use of Stomatal Frequency as an Integrating Index of the Water Relations of the Plant. Beih. Botan. Centralbl. **49** : 408 420, Erg.-Bd. (1932).

SINNOT, E. W. : Investigations on the Phylogeny of the Angiosperms : I. The anatomy of the node as an aid in the classification of the Angiosperms. Amer. Journ. Bot. **1** : 303–322 (1914).

Summary.

The stem and leaf anatomy of certain stocks of *Silene vulgaris* and *S. maritima* is described. The most important features of the internal structure of the stem are the continuous cylinder of sclerenchyma internal to the parenchymatous cortex, the swollen nodes mainly formed by a greater number of layers of the parenchymatous cortex, the large separate bundles, most often four to eight in number, in the elongated internodes, and the hollow medulla of the internodes. The general features of the anatomy are very similar in the two species, allowing for the shorter internodes of smaller diameter and less prominent nodes of *S. maritima*.

The upper epidermis of the leaf is indistinguishable from the lower in both species, though there is variation in the shape and size of epidermal cells and in the size and number of stomata in different specimens. The stomata are of caryophyllaceous type. The stomata of wild *S. maritima* material are sunk below the general epidermal level while those of *S. vulgaris* are flush with the general surface. In both species the mesophyll is divided into an upper palisade and a lower spongy portion.

Explanations of the abbreviations used in the text figures.

c.= cortex ; c.c. = crystal cluster ; e. = epidermis ; l.e. = lower epidermis ; m. = medulla ; p. = phloem ; p.t. = palisade tissue ; s. = sclerenchyma ; st. = stoma ; s.t. = spongy tissue ; u.e. = upper epidermis ; v.b. = vascular bundle ; x. = xylem.

The English Flower Garden.*—The first edition of this well known work was published in 1883. William Robinson, the author, was an early advocate of natural gardening as opposed to the formal bedding of the Victorian era when gardens were laid out in geometrical patterns. At Gravetye Manor which he bought in his heyday he was able to follow his own inclination and here he made a beautiful garden on natural lines.

Many editions of his book have appeared since 1883, the last to be revised by the author, Robinson himself, being the 15th published in 1933 and reprinted the following year. Although the original volume was published so long ago, this classic among hardening books has been found exceedingly useful to generations of gardeners, retaining to this day its widespread popularity. Now another edition appears, the 16th, revised and brought up to date. We are told in the Foreword that this unenviable task has not been an easy one since it was desirable to preserve the Robinsonian touch as far as possible. Nevertheless Mr. Roy Hay the editor of the present edition has accomplished this difficult undertaking uncommonly well. Alterations have been inevitable in the light of improved methods of culture and greater knowledge of the subject but these have served to make this edition still more useful.

The first part of the book is divided into twenty six chapters dealing with every aspect of gardening including art, design, management, planting and labour saving devices. The second part as in past editions describes the herbaceous plants, trees, flowering shrubs and hardy ferns for the open-air garden. In bringing this section up to date the descriptions of many additional plants have been included.

The editor has had the able assistance of such well known specialists as Mr. A. T. Johnson, an ardent disciple of William Robinson's teachings, Mr. W. Ingwersen with his wide knowledge of alpine plants, Mrs. Frances Perry an acknowledged authority on herbaceous and aquatic plants, Mr. J. Campbell who gives us the benefit of his knowledge of trees and shrubs, and Mr. N. P. Harvey who is fully qualified to deal with the roses. This new edition, like its predecessors, will be read with interest and welcomed by all garden lovers. It is well produced and provided with a complete index.

H. S. MARSHALL.

* The English Flower Garden. By William Robinson. Edited and revised by Roy Hay. London : John Murray, 1956. Pp. x + 723, illus. Price 42/-.

Dahlias.*—Another addition to the series of " Amateur Gardening Picture Books " has recently appeared. This deals with the propagation of dahlias and includes over 120 photographic illustrations. Cultural operations are described stage by stage from starting the tubers to the treatment of cuttings, planting out, storing, pests and diseases, etc. This book amply fulfils its purpose in providing a helpful guide to those wishing to learn something of the cultivation of this popular flower.

H. S. MARSHALL.

* Dahlias. Amateur Gardening Picture Book No. 7. By A. G. L. Hellyer. Over 120 photographs. London : W. H. & L. Collingridge Ltd. 1956. Price 7/6d.

Gardening Books.*—Another 3 handbooks have been recently published by W. H. & L. Collingridge Ltd., in the " Amateur Gardening " series. They are as follows :—

(1) *Rhododendrons and Azaleas.* After an interesting introduction there are chapters on hardy hybrid rhododendrons, dwarf rhododendrons, deciduous azaleas, dwarf evergeen azaleas, dwarf evergreen indoor azaleas, rhododendron species, rhododendrons for the warm garden and the greenhouse, and first crosses. The remaining chapters deal with cultivation and give information on the soil, planting and pot culture, feeding, pests and diseases, propagation and hybridization. The handbook includes 17 line drawings and select lists of rhododendrons.

(2) *Currants and Gooseberries.* Contains information on the culture of these popular fruits, beginning with blackcurrants. The author goes on to deal with red and white currants, pests and diseases of currants, gooseberries, pests and diseases of gooseberries, finally giving recipes for the use of these fruits in jams, jellies and syrups. The book is illustrated with 20 line drawings.

(3) *The Small Unheated Greenhouse.* This will be of interest to owners of small unheated greenhouses whose efforts to grow a few plants fail for the reason that they do not know the right plants. In this handbook Mr. Simons enlightens us and shows how to succeed. In the first part we are told all about the greenhouse itself and in the second what to grow. Here again the book is illustrated with line drawings. H. S. MARSHALL.

* (1) Rhododendrons and Azaleas. By Frederick Street. Pp. 92, 17 illus. 4/-. 1956. (" Amateur Gardening " Handbook No. 19).
(2) Currants and Gooseberries. By D. S. Crowther. Pp. 92, 20 illus. 4/-. 1956. (" Amateur Gardening " Handbook No. 29).
(3) The Small Unheated Greenhouse. By Arthur J. Simons. Pp. 92, 14 illus. 4/-. 1956. (" Amateur Gardening " Handbook No. 24).

Treasury of Trees.*—A finely produced book deserves to be called a " treasury " in the sense that it can continually be drawn on with pleasure. The book* here under notice is without doubt to be placed in such a category. Most of the photographs are admirable and the fount is excellent. Moreover the text is informative and well written. It is a pity that " cells " or " -celled " is used where the word should be "loculus" (or compartment) or " -locular ", as in describing ovaries.

There are two parts of the book : the one dealing with broad-leaved trees or hardwoods (botanically, the angiosperms) and the other with " coniferous " trees or softwoods (botanically, the gymnosperms). The photographs, by Maurice Nimms, were all taken in Britain and show general habit, bole, flowers, or inflorescences, and fruits. There are also series of plants showing leaves and winter twigs and buds of broadleaved trees and seeds of conifers. There is an adequate index. The word " tree " is very liberally interpreted since such plants as elder, hazel, privet, dogwood, and even mistletoe are included. W. B. TURRILL.

* Treasury of Trees, by H. L. Edlin and M. Nimms, Countrygoer Books Ltd., Manchester, 75/- nett, pp. 318, 1956.

A botanical travel book.*—Captain Kingdon-Ward is well known as plant collector, explorer, and author. His activities have been especially concerned with the Sino-Himalayan region and its rich and varied flora and vegetation. In the present book* he records a journey with his wife to north western Burma, in the area known as " The Triangle ", north of Bhamo between the Mali Hka or West Irrawaddy and the 'Nmai Hka or East Irrawaddy. The difficulties of preparation, especially of obtaining government permission, of arranging for supplies and their transport, and of actual travel are clearly described. The main part of the book deals with botanical exploration and with the day to day life of botanists " in the field " in a new area largely cut off from civilization.

Botanists will be particularly interested in the full account of the discovery and collecting of a new species of lily, later named *Lilium arboricola*. There are also some valuable, more general, chapters on rhododendrons in North Burma. The 45 fine photographs are well reproduced. There is a folded map and an index.

W. B. TURRILL.

* F. Kingdon-Ward, Return to the Irrawaddy, Andrew Melrose, London, 1956, pp. 224, 45 photographs, 25/- net.

Daffodil and Tulip Year Book.*—The publication of another *Daffodil and Tulip Year Book* will be appreciated by all lovers and growers of these flowers. The present volume is dedicated to Mr. Guy Wilson and contains several articles by him together with a report on his visit to Washington for the first conference of the American Daffodil Society. An excellent portrait of him forms the frontispiece. This Year Book contains valuable information concerning the development and cultivation of these popular flowers of the spring. There are articles on daffodils in America by Carey E. Quinn ; daffodils in South Australia by the Rev. E. W. Philpott, in New Zealand by J. A. O'More, and on daffodil seedlings in Oregon by Grant E. Mitsch. There is an interesting account of the development of bulb cultivation in Lincolnshire from the foundation of the industry in the eighteen-eighties to the present day with its improved methods of cultivation and mechanization.

Accounts of several shows, awards to Narcissi during 1956, Wisley Trials 1956, newly registered daffodil names and the minutes of the Narcissus and Tulip Committee are given in this well printed and freely illustrated Year Book.

H. S. MARSHALL

* The Daffodil and Tulip Year Book, 1957. No. 22. London : Royal Horticultural Society. 1956. Pp. 150, illus. Price 10/-.

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